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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 12, NUMBER 3
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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 12, NUMBER 3
FEBRUARY 1, 1979

W79-01001 -- W79-01500

The Secretary of the U.S. Department of the Interior has determined that the publication of the periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1983.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

CONTENTS

FOREWORD iii

SUBJECT FIELDS AND GROUPS

Please use the edge index on the back cover to locate Subject Fields and Indexes.

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Nonwater Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1B. Aqueous Solutions and Suspensions

THE DENSITY OF SEAWATER SOLUTIONS AT ONE ATMOSPHERE AS A FUNCTION OF TEMPERATURE AND SALINITY,
Rosenstiel School of Marine and Atmospheric Science, Miami, FL.
For primary bibliographic entry see Field 2K.
W79-01064

2. WATER CYCLE

2A. General

SOME OBSERVED STATISTICAL PROPERTIES OF SMALL SCALE TURBULENCE,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
For primary bibliographic entry see Field 2L.
W79-01055

INTERCOMPARISON OF CONCEPTUAL MODELS USED IN OPERATIONAL HYDROLOGICAL FORECASTING.
World Meteorological Organization, Geneva (Switzerland).
Operational Hydrology Report No. 7, WMO-No. 429, 1975. 195 p, 119 fig, 21 tab, 13 append.

The WMO project on the intercomparison of conceptual models used in operational hydrological forecasting was reported. The project involved the testing of 10 operational conceptual hydrological models submitted by 7 countries on 6 standard river catchment data sets from climatologically and geographically varied conditions in 6 countries. Each data set consisted of 2 distinct periods: a calibration period (6 years), and a verification period (2 years) which immediately followed after. For each data set, the model owners were supplied with the necessary concurrent observed input data (precipitation, evaporation, and other meteorological data) and observed output data (streamflow) for the 6-year calibration period, and only observed input data for the two-year verification period. For each data set, the model owners used the concurrent observed input and output data for the 6-year calibration period to calibrate and to develop the parameters of their models and employed the additional 2 years of observed input data in the verification period to produce a simulated discharge (computed output). The simulated discharges produced by the tested models for both the calibration and verification periods in each data set then were evaluated centrally and compared by WMO using several graphical and numerical verification criteria. On the basis of this evaluation and intercomparison, several conclusions and recommendations were made concerning the performance and use of the models in various forecasting situations. (See also W76-016633) (Sims-ISWS)
W79-01062

PROCEEDINGS OF DAM-BREAK FLOOD ROUTING MODEL WORKSHOP.
Water Resources Council, Washington, DC. Task Force on Dam-Break Flood Routing.
For primary bibliographic entry see Field 8B.
W79-01262

GEOMORPHOLOGIC CHARACTERISTICS OF FOURTEEN INDIANA WATERSHEDS OBTAINED FROM A COMPUTER DATA BANK OF STREAM NETWORKS,
Purdue Univ., Lafayette, IN. School of Civil Engineering.
For primary bibliographic entry see Field 4D.
W79-01426

2B. Precipitation

ACOUSTIC DOPPLER SOUNDING OF FALLING SNOW,
Toronto Univ. (Ontario). Dept. of Physics.
For primary bibliographic entry see Field 2C.
W79-01034

CORRELATIONS BETWEEN MAXIMUM RATE OF PRECIPITATION AND MESOSCALE PARAMETERS,
Quebec Univ., Montreal. Dept. of Physics.
I. I. Zawadzki, and C. U. Ro.
Journal of Applied Meteorology, Vol. 17, No. 9, p 1327-1334, September 1978. 8 fig, 9 ref.

Descriptors: *Rainfall, *Precipitation(Atmospheric), *Correlation analysis, Rain gages, Radar, Rain, Rates, Distribution patterns, Sounding, Energy, Humidity, Cloud physics, Analytical techniques, Weather, Meteorology, Meteorological parameters, Maximum precipitation rates.

Daily 5, 10, and 30 min maxima of precipitation rate determined from a rain-gage network and radar were correlated with parcel convective energies, upper air humidity, height of parcel convection, and maxima of surface conditions. After a selection of 54 well-documented cases, the correlation coefficient between the maximum of rain rate over 5 min and the maximum convective energy was 0.79 for all cases, and 0.89 for 15 air mass cases. Introducing the upper air humidity further improved the correlations. (Sims-ISWS)
W79-01036

THE RELATIONSHIP BETWEEN RADAR REFLECTIVITY FACTOR AND HAIL AT THE GROUND FOR NORTHEAST COLORADO THUNDERSTORMS,
National Center for Atmospheric Research, Boulder, CO.
For primary bibliographic entry see Field 7B.
W79-01037

PARAMETERIZATION OF SULFATE REMOVAL BY PRECIPITATION,
Battelle Pacific Northwest Labs., Richland, WA.
For primary bibliographic entry see Field 5B.
W79-01038

GEOCHEMICAL IMPLICATIONS OF SUMMER MONSONNAL RAINWATER COMPOSITION OVER INDIA,
Bhabha Atomic Research Center, Bombay (India). Div. of Radiological Protection.
For primary bibliographic entry see Field 2K.
W79-01039

PREDICTION OF CONVECTIVE ACTIVITY USING A SYSTEM OF PARASITIC-NESTED NUMERICAL MODELS,
Drexel Univ., Philadelphia, PA. Dept. of Physics and Atmospheric Sciences.
D. J. Perkey.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-16503, Price codes: A08 in paper copy, A01 in microfiche. NASA Contractor Report CR-2761, December 1976. 159 p, 33 fig, 1 tab, 74 ref, 1 append. NASA NAS8-31235, NSF GA-35093, ERDA E(11-1)-2360, AFCRL AF 19628-69-C-0092.

Descriptors: *Precipitation(Atmospheric), *Weather forecasting, *Model studies, Cloud physics, Mathematical models, Equations, Humidity, Moisture content, Temperature, Convection, Clouds, Rain, Rainfall, Forecasting, Weather, Meteorology, Forecasting models.

A limited-area, three-dimensional, moist, primitive equation (PE) model was developed to test the sensitivity of quantitative precipitation forecasts to the initial relative humidity distribution. Special emphasis was placed on the squall-line region. To accomplish the desired goal, it was necessary to develop time-dependent lateral boundaries and a general convective parameterization scheme suitable for mid-latitude systems. The sequential plume convective parameterization scheme presented was designed to have the versatility necessary in mid-latitudes and to be applicable for short-range forecasts. The results indicated that the scheme is able to function in the frontally forced squall-line region, in the gently rising altostratus region ahead of the approaching low center, and in the overriding region ahead of the warm front. (Sims-ISWS)
W79-01056

HEAT AND THRUST REQUIREMENTS OF A THERMAL FOG DISPERSAL SYSTEM,
Air Force Geophysics Lab., Hanscom AFB, MA.
For primary bibliographic entry see Field 3B.
W79-01058

STOCHASTIC MODELING OF MONTHLY AND DAILY RAINFALL SEQUENCES,
Asian Inst. of Tech., Bangkok (Thailand). Div. of Water Resources Engineering.
S. Selvalingam, and M. Miura.
Water Resources Bulletin, Vol. 14, No. 5, p 1105-1120, October 1978. 3 fig, 4 tab, 22 ref.

Descriptors: *Stochastic processes, *Rainfall, *Statistical models, *Probability, Model studies, Monthly, Synthetic hydrology, Rainfall disposition, Persistence, *Thailand, *Thomas-Fiering model, *Quae Yai River(Thailand), Wet spells, Transition probability.

A monthly model and two daily models were presented for the purpose of generating monthly and daily rainfall sequences in the Quae Yai river basin in Thailand. Performance of the models was evaluated by comparing the statistical parameters of the generated sequences with those from historical data. For generating monthly rainfall, the Thomas-Fiering model with gamma-distributed random variable was used. Daily model I, which assumed no persistence between daily rainfall amounts within the wet spells, could not preserve some important parameters regardless of the simplicity in model construction. Application of multi-state transition probability matrix gave good results, although the user must modify some parameters looking at the performance of the model for each historical record. (Singh-ISWS)
W79-01244

CHARACTERISTICS OF RAINFALL CONDITIONS WITH PARTICULAR REFERENCE TO NORTH EAST ENGLAND,
Northumbrian Water Authority, Gosforth (England).
P. S. Kelway.
Journal of the Institution of Water Engineers and Scientists, Vol. 31, No. 4, p 251-268, 284, July 1977. 9 fig, 7 tab, 1 ref.

Descriptors: *Rainfal, *Hydrographs, *Runoff, *Rainfall disposition, Distribution patterns, Storm runoff, Floods, Storms, Watersheds(Basins), Annual, Model studies, Duration curves, Peak discharge, Foreign countries, Foreign research, Flood recurrence intervals, Data collections, *Great Britain.

Rainfall conditions affect a large number of the functions of a water authority; and, in many cases, the exact nature of the distribution in time and space is not of major importance. However, in the broad field of what can be classified conveniently as 'operations,' a good knowledge of the distribution and degree of variability of rainfall is of fundamental importance to effective management. Few large-scale problems occur in the Northumbrian Water Authority's (NWA) sphere of activity unless rainfall persists long enough to give totals of at least 30 mm as an average fall over a catchment in a duration of less than 24 hours. As a preliminary means of investigating rainfall types over the NWA area, it was decided to select all storm conditions which gave 50 mm for at least one point in 24 hours or less. In a 30-year period this yielded

55 storms for analysis. Although there was little correlation between rainfall pattern and snyoptic type, there was very good seasonal cohesion for many groups. Flood events produced by relatively minor rainfall amounts, i.e, falls not exceeding 50 mm at any point, show a greater predominance in the winter half-year. This is not surprising as the generally wetter ground then will produce a larger number of flood events from the lighter rainfall. The necessary gauge density for an operational network will depend on the rainfall distribution patterns which are likely. For a realistic study of cost-effectiveness, the anticipated rainfall conditions under which the network is to operate must be studied. The study of meteorological conditions and their effect on rainfall patterns in time and space promises to help the water industry in a number of roles. Much has yet to be done to equate the requirements of the engineer to broadly-based but meaningful information. (Humphreys-ISWS)
W79-01247

GENERATION OF DAILY PRECIPITATION OVER AN AREA,
Agricultural Research Service, Temple, TX.
C. Richardson.
Water Resources Bulletin, Vol. 14, No. 5, p 1035-1047, October 1978. 5 fig, 4 tab, 9 ref.

Descriptors: *Precipitation(Atmospheric), *Model studies, *Daily hydrographs, Stochastic processes, Areal, Fourier analysis, Atmospheric physics, Probability, Probable maximum precipitation, Mathematical studies, *Stochastic structure, Multivariate normal distribution, Generation, Areal precipitation, Periodic.

A model was developed of the periodic-stochastic structure of daily precipitation over an area. The model was based on a multi-variate normal distribution. The square roots of daily precipitation at a point were found to approximate a sample from a uni-variate normal distribution that had been truncated at zero. The zero daily precipitation amounts were considered negative amounts of unknown quantity. The multivariate normal distribution was used to describe the variation of daily precipitation over an area. The periodic fluctuations of the model parameters were described with Fourier series. The model was tested using data from two areas of different precipitation characteristics. Data generated with the model contained many of the statistical characteristics observed in the historical data. (Roberts-ISWS)
W79-01261

TIME AVERAGED AREAL MEAN OF PRECIPITATION: ESTIMATION AND NETWORK DESIGN,
Puerto Rico Univ., Mayaguez.
R. L. Bras, and R. Colon.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 938, Price codes: A04 in paper copy, A01 in microfiche. Puerto Rico Water Resources Research Institute Completion Report, February 1977. 44 p, 14 fig, 10 tab, 7 ref. OWRT-A-050-PR(1).

Descriptors: *Network design, *Rainfall, *Data collections, *Precipitation(Atmospheric), *Mathematical studies, Statistical analysis, Hydrology, Statistics, Estimating equations, Equations, Areal mean of precipitation, Time-averaged areal mean.

A methodology for designing and analyzing data collection networks with the goal of obtaining the best estimate of time averaged areal mean of precipitation was presented. This involved using a state augmentation procedure and multivariate linear estimate concepts, in particular, the Kalman-Bucy filter. The resulting technique can be used to analyze existing data networks, design new networks, and process data from existing networks. The procedure can handle any network configuration, and explicitly accounts for the number of stations, their particular location, the duration of observations, and the measurement errors. Advantages of the procedure are generality, and the fact that it explicitly acknowledges an unknown mean for the process and allows introduction of prior information. (Majtenyi-IPA)
W79-01357

THE SLOPE OF GRAN'S PLOT: A USEFUL FUNCTION IN THE EXAMINATION OF PRECIPITATION, THE WATER-SOLUBLE PART OF AIRBORNE PARTICLES, AND LAKE WATER,
For primary bibliographic entry see Field 5A.
W79-01474

2C. Snow, Ice, and Frost

ACOUSTIC DOPPLER SOUNDING OF FALLING SNOW,
Toronto Univ. (Ontario). Dept. of Physics.
H. Melling, and R. List.
Journal of Applied Meteorology, Vol. 17, No. 9, p 1267-1273, September 1978. 7 fig, 3 tab, 18 ref.

Descriptors: *Remote sensing, *Snow, *Acoustics, *Sound waves, Snowfall, Radar, On-site investigations, Data processing, Sounds, Sounding, Precipitation(Atmospheric), Weather, Meteorology, Doppler sounding, Acoustic sounding.

Acoustic echoes received during snowfall were investigated using a vertically directed echo sounder. Doppler shift analysis of the echoes indicated consistent downward motion in the range 1-2 m/s, and thus demonstrated that the snowflakes are the cause of the observed backscattering. Consideration of the mean scattered power yielded a radar reflectivity for the snow of 35-42 dBZ and a precipitation rate of 1.2-2.7 mm/h. The latter figure may be compared with the actual mean precipitation rate of 0.9 mm/h averaged over the duration of the showers and over intervening periods of little or no snow. The observed probability distribution of instantaneous echo power was log-normal. This is in contrast to the theoretically predicted exponential function. The standard deviation of the log-normal distribution is close to 6.1 dB, which is the saturation value expected for acoustic waves interacting strongly with the turbulent atmosphere. Thus, multiple scattering may be significant in these observations, and also generally in atmospheric echo sounding. (Sims-ISWS)
W79-01034

RANDOMIZED CLOUD SEEDING IN THE SAN JUAN MOUNTAINS, COLORADO,
Aerometric Research Inc., Goleta, CA.
For primary bibliographic entry see Field 3B.
W79-01035

THE RELATIONSHIP BETWEEN RADAR REFLECTIVITY FACTOR AND HAIL AT THE GROUND FOR NORTHEAST COLORADO THUNDERSTORMS,
National Center for Atmospheric Research, Boulder, CO.
For primary bibliographic entry see Field 7B.
W79-01037

APPROXIMATE CALCULATION OF NONSTATIONARY TEMPERATURE REGIME OF A ROCK-ICE DAM.
For primary bibliographic entry see Field 8D.
W79-01049

ORGANIZATION OF FULL-SCALE ANALYSES OF FILTRATION-THERMAL REGIME OF TAILINGS DAMS ON PERMAFROST FOUNDATIONS,
For primary bibliographic entry see Field 8D.
W79-01050

TAILINGS COFFERDAMS ON PERMAFROST FOUNDATIONS IN YAKUTSKAYA ASSR,
For primary bibliographic entry see Field 8D.
W79-01051

A SOCIETAL ASSESSMENT OF THE PROPOSED SIERRA SNOWPACK AUGMENTATION PROJECT,
Human Ecology Research Services, Inc., Boulder, CO.
For primary bibliographic entry see Field 3B.
W79-01063

MICROWAVE REMOTE SENSING OF SEA ICE IN THE AIDJEX MAIN EXPERIMENT,
Geological Survey, Tacoma, WA. Water Resources Div.; and Department of the Environment, Ottawa(Ontario).
W. J. Campbell, J. Wayenberg, J. B. Ramseyer, R. O. Ramseier, and M. R. Vant.
Boundary-Layer Meteorology 13, D. Reidel Publishing Company, Dordrecht, Holland, p 309-337, 1978. 19 fig, 2 tab, 41 ref.

Descriptors: *Remote sensing, *Sea ice, *Infrared radiation, *Microwaves, *Arctic, Aircraft, On-site data collections, Ice-water interfaces, Ice cover, Analytical techniques, Evaluation, *Beaufort Sea, *Sea-ice types.

During the Arctic Ice Dynamics Joint Experiment (AIDJEX), April 1975 through May 1976, a comprehensive microwave sensing program was performed on the sea ice of the Beaufort Sea. Surface and aircraft measurements were obtained during all seasons using a wide variety of active and passive microwave sensors. The surface program obtained passive microwave measurements of various ice types using four antennas mounted on a tracked vehicle. In three test regions, each with an area of approximately 15 thousand sq mi, detailed ice crystallographic, dielectric properties, and brightness temperatures of first-year, multiyear, and first-year/multiyear mixtures were measured. A NASA aircraft obtained passive microwave measurements of the entire area of AIDJEX manned station array (triangle) during each of 18 flights. This verified the earlier reported ability to distinguish first-year and multiyear ice types and concentration and gave new information on ways to observe ice mixtures and thin ice types. The active microwave measurements from aircraft included those from an X- and L-band radar and from a scatterometer. The former is used to study a wide variety of ice features and to estimate deformations, while both are equally usable to observe ice types. With the present data only the scatterometer can be used to distinguish positively multiyear ice from first-year ice and various types of thin ice. This is best done using coupled active and passive microwave sensing. (Woodard-USGS).
W79-01386

2D. Evaporation and Transpiration

AN ENERGY BUDGET ANALYSIS OF EVAPOTRANSPIRATION FROM SALTCEDAR,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 3B.
W79-01231

ANNUAL CATCHMENT LOSSES-A PRACTICAL METHOD,
Welsh National Water Development Authority, Cardiff.
W. L. Jack.
Journal of the Institution of Water Engineers and Scientists, Vol. 31, No. 4. p 280-284, July 1977. 1 fig, 2 tab, 9 ref.

Descriptors: *Watersheds(Basins), *Evapotranspiration, *Water loss, *Estimating, Annual, Analytica techniques, Weathering, Elevation, Forests, Data collections, Foreign countries, Foreign research, Evaporation, *Wales.

The need for estimates of annual catchment losses in water resources work has been appreciated for a long time, but very few guidelines are available to hydrologists. The lack of published information reflects the difficulty of obtaining accurate data on which to base such guidelines. This paper related

evapotranspiration losses to elevation, exposure, and afforestation for Welsh catchments and gave examples of the range of losses found. For using the methods in other parts of Britain, three additional adjustments were suggested. Actual evapotranspiration for a catchment is dependent on many variables, including soil cover, type of vegetation, slope, aspect, elevation, cloud cover, temperature, humidity, etc. The three parameters, vegetation, soil cover, and radiation input, were considered to be the primary variables within the Welsh National Water Development Authority area. These three parameters are not at all easy to measure, but they relate to another three parameters which were finally selected, namely elevation of the catchment, exposure of the catchment and degree of afforestation. The catchment losses derived by the technique described are average annual losses. (Humphreys-ISWS)
W79-01248

2E. Streamflow and Runoff

COLORADO BIG THOMPSON FLOOD: GEOLOGIC EVIDENCE OF A RARE HYDROLOGIC EVENT,
Denver Univ., CO. Dept. of Geography.
J. E. Costa.
Geology, Vol. 6, No. 10, p 617-620, October 1978. 5 fig, 24 ref.

Descriptors: *Flash floods, *Flood recurrence interval, *Colorado, *Geologic investigations, Disasters, Floods, Flood discharge, Stratigraphy, Geological surveys, On-site investigations, Dating, *Big Thompson River(Colorado).

Conventional engineering hydrologic analysis of the 1976 Colorado centennial Big Thompson flood indicates that the flood event, while castrophic, was not extremely unusual. The geologic evidence in the area immediately below the area of maximum runoff, however, indicates that a flood of this magnitude had not occurred in the main channel for several thousand years. Alluvial-fan deposits extensively eroded by the flood waters were dated by observations of hue oxidation, coring of trees, and 14C dating of buried charcoal. Some eroded deposits were as old as 7,000 to 10,000 14C yr. Where usable, geologic evaluations of extreme flood events may yield more accurate estimates of the risk of large, rare floods than conventional methods. (Humphreys-ISWS)
W79-01047

SIMULATION OF FLOOD WAVES IN CHANNELS,
Bristol Univ. (England). Dept. of Civil Engineering.
S. W. Huntington.
PhD Dissertation, April 1974. 234 p, 93 fig, 65 ref, 4 append.

Descriptors: *Urbanization, *Floods, *Model studies, Mathematical models, Hydraulic models, Instrumentation, Photography, On-site investigations, On-site data collections, Watersheds(Basins), Runoff, Streamflow, Rivers, Flood plains, Flood control, Waves(Water), Flood waves, Flood routing, Wave pile-up, Cities, Hydraulics, Hydrology.

Urbanization of an area susceptible to flooding usually aggravates considerably the problem of flooding. Two major constituent factors are apparent: namely, accentuation of the flood wave due to increased rates of flow from sewer systems, and reduction of the natural storage potential of a channel system following development on flood plains. Such problems are envisaged subsequent to the urbanization of parts of North Gloucestershire, upon which area attention in this study was focussed. However, data collected from this and other areas suggest that the problems of the study area are typical, and as such, the findings of this research have a wider relevance. This particular study investigated the problems associated with the effects of modifying the flood plains in a channel system which is expectd to carry an accentuated hydrograph. Both physical and numerical model studies were carried out in order to study the effectiveness of flood plains in controlling flood levels. The physical model was used to examine the basic mechanics of the problem, and the numerical model was employed to compile these results to real rivers. The results from the physical model indicated in a qualitative manner the performance of various geometries of flood plain and the effect of downstream controls. On the basis of available data, the numerical model was shown to simulte the physical model results sufficiently well to justify application of the basic techniques to flood wave propagation in real rivers. (Sims-ISWS)
W79-01060

INTERCOMPARISON OF CONCEPTUAL MODELS USED IN OPERATIONAL HYDROLOGICAL FORECASTING.
World Meteorological Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 2A.
W79-01062

FLOOD PLAIN INUNDATION CAUSED BY DAM FAILURE,
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
For primary bibliographic entry see Field 8B.
W79-01265

FLOODS FROM BREACHING OF DAMS,
Nunn, Snyder and Associates, Fairfax, VA.
For primary bibliographic entry see Field 8B.
W79-01267

UNSTEADY FLOW MODELING OF DAM-BREAK WAVES,
Tennessee Valley Authority, Knoxville.
For primary bibliographic entry see Field 8B.
W79-01268

A SIMULATION OF THE HYDRAULIC EVENTS DURING AND FOLLOWING THE TETON DAM FAILURE,
Bureau of Reclamation, Denver, CO. Engineering Research Center.
For primary bibliographic entry see Field 8B.
W79-01269

COMPARATIVE ANALYSIS OF ROUTING TECHNIQUES FOR THE FLOODWAVE FROM A RUPTURED DAM,
California Univ., Davis. Dept. of Water Science and Civil Engineering.
For primary bibliographic entry see Field 8B.
W79-01272

A NUMERICAL MODEL FOR MULTIDIMENSIONAL UNCONSTRAINED FLOW OVER IRREGULAR TERRAIN,
Energy Inc. Idaho Falls, ID.
For primary bibliographic entry see Field 8B.
W79-01275

SIMULATION OF DAM BREAK FLOODING UNDER NORMAL AND PROBABLE MAXIMUM FLOOD CONDITIONS,
Tippett-Abbett-McCarthy-Stratton, New York.
For primary bibliographic entry see Field 8B.
W79-01277

CRITERIA FOR ROUTING THE DAM-BREAK FLOOD,
Pacific Gas and Electric Co., San Francisco, CA.
For primary bibliographic entry see Field 8B.
W79-01278

LOW-FLOW CHARACTERISTICS OF STREAMS IN THE ROCK-FOX RIVER BASIN, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
B. K. Holmstrom.
Water-Resources Investigations 78-85 (open-file report), August 1978. 98 p, 6 fig, 2 plates, 3 tab, 15 ref.

Descriptors: *Low flow, *Streamflow, *Regression analysis, *Equations, Analytical techniques, Flow duration, Low-flow frequency, Wisconsin, *Rock-Fox River basin.

Low-flow characteristics of streams in the Rock-Fox River basin, Wis., include estimates of low-flow frequency ad flow duration at 13 gaging stations; low-flow frequency characteristics at 32 low-flow partial-record stations and 78 miscellaneous sites; and a list of base-flow discharge measurements at 244 miscellaneous sites. Equations are provided to estimate low-flow characteristics at ungaged sites and at sites where one base-flow discharge measurement is availabe. The equations were determined from multiple-regression analyses that related low-flow characteristics at gaging stations and low-flow partial-record stations to basin characteristics. The standard error of estimate is provided for each method of estimating the annual minimum 7-day mean flow below which the flow will fall on the aveage of once in 2 years and once in 10 years. Standard error provides the user with the expected degree of accuracy for each method. (Woodard-USGS).
W79-01366

RUNOFF FROM HYDROLOGIC UNITS IN FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01368

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 2A: SOUTHERN FLORIDA, SURFACE WATER.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01370

THE CASE OF THE SHRINKING CHANNELS-THE NORTH PLATTE AND PLATTE RIVERS IN NEBRASKA,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 4A.
W79-01380

2F. Groundwater

CALCIFICATION AND ITS ROLE AMONG THE MACROALGAE,
California Univ., Irvine. Dept. of Ecology and Evolutionary Biology.
For primary bibliographic entry see Field 2I.
W79-01097

FIELD PERMEABILITY METHODS FOR IN-PLACE LEACHING,
Bureau of Mines, Twin Cities, MN. Twin Cities Mining Research Center.
P. G. Chamberlain.
Mining Congress Journal, Vol. 64, No. 9, p 22-25, September, 1978. 5 fig, 5 ref.

Descriptors: *Permeability, *Leaching, *Mining engineering, Pumping tests, Pressure head, Wells, Drilling.

Field permeability techniques were surveyed to determine which ones could be used by mine operators to evaluate formations for potential leachability. Relevent methods were described in a 'cookbook' (Field Permeability Test Methods with Applications to Solution Mining) which included detailed test procedures, analysis techniques and required equipment. The most suitable tests, constant-head, variable-head and pumping tests, are

performed by injecting or withdrawing water from wells drilled onto the formation. Pumping tests employ two or more observation wells and provide more accurate estimates of the fluid flow conditions during leaching operations than do other tests. Where cost and ease of operation are more important than extreme accuracy, constant-heat and /or variable-head tests should be used. It is important that testing wells be drilled with minimal formation contamination to minimize plugging of the permeability channels. Once a suitable well has been drilled, essential testing procedures are: (1) injecting (or withdrawing) water; (2) measuring this water; (3) measuring the pressure (or head) in the test zone; and (4) measuring time. Equipment can range from water bucket and tape measures to sophisticated instrument packages. Certain tests require special equipment and it may be desirable to run more than one test to verify results. (Purdin-NWWA)
W79-01111

REGIONAL GEOLOGY SERIES: PART X,
National Water Well Association, Worthington, OH.
H. W. Heiss.
Water Well Journal, Vol. 30, No. 11, p 83-84, November, 1978. 1 fig.

Descriptors: *Ground water, *Regional analysis, *Geology, *Drilling, Aquifers, Glacial drift, Sedimentary rocks, Water quality, Underground storage.

The Glaciated Central Region is characterized by a thick mantle of glacial drift overlying consolidated rocks. The sand and gravel deposits in this region act as prolific ground water reservoirs for municipal, domestic and agricultural wells, help recharge deeper aquifers, and sustain base flow of streams. Sedimentary formations, especially sandstones, form the region's major ground water reservoir. Increased withdrawal of ground water in several major cities has caused a gradual decline in artesian pressure in the sandstone. The region's limestones are only moderately productive but are important water sources in some areas. Fill may contain deposits of sand or sand and gravel with reliable yields. Permeable valley train deposits of pre-glacial river beds may be excellent ground water reservoirs or storage reservoirs for cooling water. Drillers in the Glaciated Central Region use cable tool, mud rotary, reverse rotary, augering and jetting methods. Drilling problems are minimal with occasional caving sands and boulder fields. Water quality is generally good. Hardness, high iron concentrations and hydrogen sulfide are reported in some glacial drift, deep limestone, and shales. (Purdin-NWWA)
W79-01115

HYDROLOGY OF THE NEVIN WETLAND NEAR MADISON, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 2H.
W79-01213

PARAMETER IDENTIFICATION IN AN INHOMOGENEOUS MEDIUM WITH FINITE ELEMENT METHOD,
California Univ., Los Angeles. Dept. of Engineering Systems.
Y. S. Yoon, and W. W-G. Yeh.
Society of Petroleum Engineers of AIME, Dallas, Texas Paper Number SPE 5524 October, 1975. 12 p, 3 fig, 2 tab, 20 ref. (California Water Resources Center Project UCAL-WRC-W-290).

Descriptors: *Mathematical models, *Algorithms, *Parametric hydrology, Unsteady flow, Least squares method, Model studies, Porous media, *Finite element analysis, Aquifers.

An efficient algorithm is developed for parameter identification in a nonlinear partial differential equation of parabolic type associated with a two-dimensional unsteady fluid flow through a porous medium. The parameter chosen for identification is the hydraulic conductivity which is a function of space variables. Finite elements are used to represent the unknown function parametrically in terms of nodal values over a suitable discretization of the space variables. These nodal values are then determined by the least-squares fitting between the observed and calculated flow potentials, subject to linear inequality constraints imposed upon the parameters to be identified. To handle such constraints, Rosen's gradient projection technique is combined with the Gauss-Newton method. Efficient numerical procedures are presented for the solution of the partial differential equation using the Galerkin method and a predictor-corrector approach. (Snyder-Calif, Davis)
W79-01341

LAND SUBSIDENCE IN THE SANTA CLARA VALLEY,
Geological Survey, Sacramento, CA. Water Resources Div.
J. F. Poland.
Water Spectrum, p 11-16, Spring 1978. 7 fig.

Descriptors: *Land subsidence, *Groundwater, *Overdraft, *Aquifers, *Hydrogeology, Saline water intrusion, Flood damage, Engineering structures, Levees, Flood control, Groundwater recharge, Reparing, Well casings, Roads, Bridges, Railroads, Costs, Evaluation, *California, *Santa Clara Valley(Calif), *San Francisco Bay area(Calif).

The Santa Clara Valley in California is a long, narrow structural through that extends about 90 miles southeast from San Francisco, with the bay occupying much of its northern third. This article focuses on the densely populated central third of the valley. Most of this central area experienced one to eight feet of subsidence from 1934 to 1967 caused by groundwater overdraft. Lands adjacent to San Francisco Bay have sunk two to eight feet since 1912, requiring construction and raising of levees to restrain landward movement of the saline bay water onto 17 square miles of land now below high-tied level. Also, flood-control levees have beeen built and maintained near the bayward ends of the depressed stream channels. by 1974 about $9 million had been spent for flood-control levees on the streams entering the bay to correct for subsidence effects. The cost of repair or replacement of damaged wells reportedly has been $4 million. Including funds spent on maintaining the salt-pond levees, establishing and relieving the bench-mark network, repairing railroads, roads, and bridges, and making private engineering surveys, the gross costs of subsidence are in the range of $15-20 million to date. (Woodard-USGS)
W79-01365

PROBABLE YIELDS OF WELLS IN THE NIAGARA AQUIFER, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01367

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 2B: SOUTHERN FLORIDA, GROUND WATER.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01371

DIGITAL-MODEL SIMULATION OF THE GLACIAL-OUTWASH AQUIFER, OTTER CREEK-DRY CREEK BASIN, CORTLAND COUNTY, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
O. J. Cosner, and J. F. Harsh.
Water-Resources Investigations 78-71 (open-file report), 1978. 34 p, 12 fig, 4 tab, 19 ref.

Descriptors: *Hydrogeology, *Aquifer characteristics, *Water table, *Computer models, *Surface-groundwater relationships, Glacial aquifers, Groundwater movement, Withdrawal, Groundwater recharge, Leakage, Seepage, Digital computers, Analytical techniques, *New York, Cortland County(NY), *Otter Creek-Dry Creek basin(NY), Simulation analysis.

The city of Cortland, New York, and surrounding areas obtain water from the highly productive glacial-outwash aquifer underlying the Otter Creek-Dry Creek basin. Pumpage from the aquifer in 1976 was approximately 6.3 million gallons per day and is expected to increase as a result of population growth and urbanization. A digital ground-water model that uses a finite-difference approximation technique to solve partial differential equations of flow through a porous medium was used to simulate the movement of water within the aquifer. The model was calibrated to equilibrium conditions by comparing water levels measured in the aquifer in March 1976 with those computed by the model. Then, from the simulated water-level surface for March, a transient-condition run was made to simulate the surface as measured in September 1976. Computed water levels presented as contours are generally in close agreement with potentiometric-surface maps prepared from field measurements of March and September 1976. (Woodard-USGS)
W79-01377

HYDROGEOLOGIC MAPS OF A FLOOD DETENTION AREA PROPOSED BY SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT GREEN SWAMP AREA, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01383

GROUND-WATER RESOURCES AND GEOLOGY OF COLUMBIA COUNTY, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
C. A. Harr, L. C. Trotta, and R. G. Borman.
Wisconsin Geological and Natural History Survey Madison, Information Circular No 37, 1978. 30 p, 16 fig, 1 plate, 24 ref.

Descriptors: *Groundwater resources, *Geology, *Hydrogeology, *Aquifer characteristics, *Water quality, Groundwater availability, Pumping, Water yield, Groundwater recharge, Groundwater movement, Water utilization, Wisconsin, *Columbia County.

Columbia County, Wisconsin, is underlain by two major aquifers; the sandstone and sand-and-gravel aquifers. Fifteen gallons per minute (gpm) can be obtained from wells almost anywhere in the county. Yields of more than 1,000 gpm are available from the sand-and-gravel aquifer where the saturated thickness is sufficient. The sandstone aquifer underlies most of the county and is more than 700 feet thick in the south-central part. It is capable of yielding more than 1,000 gpm in about three-fourths of the county and is the principal source of municipal water supplies. The chemical quality of water from the two aquifers is similar. It is very hard, and much of it contains excessive amounts of iron and manganese. Concentrations of dissolved solids and chloride are highest in areas underlain by bedrock of Ordovician age. About 5.0 million gallons per day of water was pumped in 1974, of which 90 percent was from the Sandstone aquifer. About 45 percent of the water was for industrial and commercial purposes, 37 percent was for residential use, 16 percent for municipal use, and 2 percent for irrigation. (Woodard-USGS)
W79-01384

SEASONAL VARIATION IN PCO2 AND C-13 CONTENT OF SOIL ATMOSPHERE,
Geological Survey, Idaho Falls, ID. Water Resources Div.
C. T. Rightmire.
Water Resources Research, Vol 14, Nσ 4, p 691-692 Aug 1978 1 fig 9 ref.

Descriptors: *Geochemistry, *Groundwater recharge, *Soil gases, *Carbon dioxide, *Stable isotopes, Seasonal, Fluctuations, Sampling, Analytical techniques.

Soil carbon dioxide is the dominant source of dissolved inorganic carbon in recharging waters. Samples of soil Co2 were collected to determine if seasonal variations in C-13 content parallel those previuosly observed for pc02. Significant seasonal variations in both Pco2 and C-13 content were observed. Studies of groundwater carbonate chemistry require knowledge o the season during which major recharge occurs. (Woodard-USGS)
W79-01387

TRICHLOROFLUOROMETHANE, A NEW HYDROLOGIC TOOL FOR TRACING AND DATING GROUND WATER,
Indiana Univ. at Bloomington.
G. M. Thompson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 978, Price codes: A06 in paper copy, A01 in microfiche. Ph.D. Dissertation, 1976. 94 p, 18 fig, 32 ref. OWRT A-047-IND(2).

Descriptors: *Groundwater movement, Groundwater, Tritium, Gas chromatography, *Tracers, *Dating, Aquifers, Texas, New Jersey, Alabama, *Trichlorofluoromethane, *Groundwater age, Hot Springs National Park(Ala), Wheaton Tract(NJ), Edwards Aquifer(Tex).

It was assumed that the amount of trichlorofluoromethane (CCl3F) present in the groundwater would serve as an indicator of the age and movement of such water. Preliminary investigations were conducted in three areas where the hydrology was well understood and where tritium measurements had been made in the past. They were: the Wharton tract in southern New Jersey, Hot Springs National Park, Alabama, and the Edwards aquifer of south central Texas. Good agreement was observed between the CCl3F data and the known hydrology. The Texas study revealed a series of anomalous CCl3F concentrations that were too high to be of atmospheric origin. The anomalous points occurred in a line extending from the northwest corner of San Antonio 46 miles along the Balcones fault zone. The location of the plume indicates direction of ground-water movement in the area and demonstrates the likely utility of CCl3F as a ground-water tracer. All CCl3F measurements were made in the field with a portable gas chromatograph especially designed and built for the purpose. (Wiersma-Purdue)
W79-01422

2G. Water In Soils

A PROBABILISTIC ANALYSIS OF EMBANKMENT STABILITY PROBLEMS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Soils and Pavements Lab.
For primary bibliographic entry see Field 8D.
W79-01054

SIMULATION OF SOIL EROSION IN THE PALOUSE PRAINE OF THE PACIFIC NORTHWEST,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4D.
W79-01087

RELATION OF WATER ABSORPTION TO DURATION OF APPLICATION IN FURROW IRRIGATION,
Mississippi State Univ., Mississippi State. Dept. of Agricultural and Biological Engineering.
For primary bibliographic entry see Field 3F.
W79-01094

REMOTE SENSING OF WATER LEVELS IN SMALL-DIAMETER WELLS,
Southern Piedmont Conservation Research Center, Watkinsville. GA.
For primary bibliographic entry see Field 7B.
W79-01101

CADMIUM AVAILABILITY TO RICE IN SLUDGE-AMENDED SOIL UNDER 'FLOOD' AND 'NONFLOOD' CULTURE,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5E.
W79-01127

ELECTRON SPIN RESONANCE ANALYSIS OF SEMIQUINONE FREE RADICALS OF AQUATIC AND SOIL FULVIC AND HUMIC ACIDS,
New Hampshire Univ., Durham. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W79-01133

YIELD AND CADMIUM ACCUMULATION OF FORAGE SPECIES IN RELATION TO CADMIUM CONTENT OF SLUDGE-AMENDED SOIL,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5C.
W79-01237

ESTIMATION OF WATER BALANCE OF LOWER SUTLEJ CATCHMENT UP TO BHAKRA DAM SITE BY THORNTHWAITE'S METHOD,
Meteorological Office, New Delhi (India).
For primary bibliographic entry see Field 4A.
W79-01257

GROWTH AND CADMIUM ACCUMULATION OF PLANTS GROWN ON A SOIL TREATED WITH A CADMIUM-ENRICHED SEWAGE SLUDGE,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5C.
W79-01282

THE ECOTONE BETWEEN SPARTINA FOLIOSA TRIN. AND SALICORNIA VIRGINICA L. IN SALT MARSHES OF NORTHERN SAN FRANCISCO BAY: III. SOIL AERATION AND TIDAL IMMERSION,
California Univ., Berkeley. Dept. of Botany.
For primary bibliographic entry see Field 2L.
W79-01283

MICRO-INHABITANTS OF MARSH PEAT SOILS IN THE TOMSK REGION,
For primary bibliographic entry see Field 2H.
W79-01299

INTERRELATION BETWEEN INSECT LARVAE AND SOIL MICROFLORA IN FOREST BOGS,
L. S. Kozlovskaya, and L. M. Zagural'skaya.
In: Interrelation of Forest and Bog, p 88-97, 1967. 5 tab, 15 ref. Translated from Russian.

Descriptors: *Bogs, *Larvae, *Microorganisms, *Soil formation, Wetlands, Insects, Larval growth stage, Bacteria, Soil environment, USSR.

Insect larvae play an important role int the soil formation process. They first convert nitrogen into soluble forms which correspond to the composition of the microflora of their intestines. Second, they activate fewer groups of microflora than the Enchytraeids an Lumbricids earthworms. An increase in the number of ammonifying bacteria, including fluorescent bacteria, vegetative forms of spore-forming bacteria, bacteria capable of utilizing mineral nitrogen, and oligonitrophilic bacteria in the intestines was a unique feature of all three insect families, Tipulidae, Sciaridae, and Bibionidae, under study. There was an absence of cellulose-decomposing bacteria in the alimentary tract of the larvae of these insects. There was also a considerable decrease in the number of fungi and spores. The composing of the microflora from larvae excrements points to continuous intensive decomposition processes. The excrement contaned many organisms growing on the mineral nitrogen source; there was a lack of actinomycetes and cellulose-decomposing microorganisms and an increase in spore-farming bacteria. The interrelation with the microflorain controlled by the type of food material and the specific conditions inside the animal intestines. (See also W79-01297) (Steiner-Mass)
W79-01301

GROUP 'B' VITAMINS IN PEAT SOILS AND EXCREMENT OF INVERTEBRATES,
S. R. Dik.
In: Interrelation of Forest and Bog, p 98-104, 1967. 5 tab, 16 ref. Translated from Russian.

Descriptors: *Muck soils, *Vitamin B, *Invertebrates, Wetlands, Bogs, Marshes, Peat, Microorganisms, Soil bacteria, Soil environment, USSR.

A comparison of mineral and marsh soil shows that the vitamin B1 and B2 content in the latter is higher despite the low microflora content. Factors explaining this are: first, an abundance of plant material is present in peat soils during soil decomposition and the vitamins in this material are released into the soil; second, the humidity of the marsh soils during the summer months favors microorganism activity whereas in chernozem soils the steep reduction in water content limits beneficial microflora activity. Especially large amounts of vitamin B2 are found in the excrement of soil invertebrates capable of living in peat soils. Some B2 vitamin is also found in the excrement of earthworms; less in the excrement of Enchytraeids. Generally there is 1.7 times more B2 in the excrement of either animal than in peat soil. This can be explained by the fact that the excrement of soil organisms provides better conditions for the development of microflora, which serve as a source of vitamins in the soil. (See also W79-01297)(Steiner-Mass)
W79-01302

ROLE OF EXCREMENT OF INVERTEBRATES IN THE ACTIVATION OF MICROFLORA OF MARSH PEAT SOILS,
L. S. Kozlovskaya.
In: Interrelations of Forest and Bog, p 105-128, 1967. 2 fig, 7 tab, 21 ref. Translated from Russian.

Descriptors: *Muck soils, *Soil bacteria, *Invertebrates, *Larvae, Wetlands, Bogs, Marshes, Peat, Microorganisms, Soil environment, Decomposing organic matter, Annelids, Insects, USSR.

The maximum and minimum of oligochaetes and larvae of two-winged insects coincide with the maximum and minimum numbers of ammonifying bacteria, microorganisms growing on mineral nitrogen, and oligonitrophilic microorganisms. These groups become active in the animal excrement, assimilating the different nitrogen compounds for their energy, and accelerate the organic matter decomposition process. Available nitrogen increases under the influence of ammonifying microorganisms and potassium increases under the influence of cellulose-decomposing microorganisms. (See also W79-01297) (Steiner-Mass)
W79-01303

CARBON AND NITROGEN TRANSFORMATIONS IN SOILS AMENDED WITH SEWAGE SLUDGE,
Purdue Univ., Lafayette, IN.
For primary bibliographic entry see Field 5C.
W79-01350

SEASONAL VARIATION IN PCO2 AND C-13 CONTENT OF SOIL ATMOSPHERE,
Geological Survey, Idaho Falls, ID. Water Resources Div.

For primary bibliographic entry see Field 2F.
W79-01387

2H. Lakes

TOTAL MERCURY AND METHYL MERCURY CONTENTS IN FISH FROM LAKE PAIJANNE,
Jyvaskyla Univ. (Finland). Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W79-01028

CHLORINATED HYDROCARBONS AND MERCURY IN AQUATIC VASCULAR PLANTS OF LAKE PAIJANNE, FINLAND,
Jyvaskyla Univ. (Finland). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-01029

DISSOLVED MERCURY IN THE LAKE WINDERMERE CATCHMENT AREA,
Liverpool Univ. (England). Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W79-01040

SAND TRANSPORT MODEL OF BARCHAN DUNE EQUILIBRIUM,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 2J.
W79-01043

WIND EFFECTS ON SURFACE TO BOTTOM FRONTS,
Woods Hole Oceanographic Institution, MA.
For primary bibliographic entry see Field 2L.
W79-01045

THE EFFECTS OF LAND USE ON PHOSPHORUS LOADING: A CASE STUDY - SIX MILE RUN RESERVOIR,
Rutgers University Dept. of Environmental Science New Brunswick, New Jersey.
For primary bibliographic entry see Field 5C.
W79-01086

QUANTITATIVE AND QUALITATIVE CHANGES IN THE PHYTOPLANKTON OF LAKE KINNERET, ISRAEL, 1972-1975,
Israel Oceanographic and Limnological Research Ltd., Haifa.
For primary bibliographic entry see Field 5C.
W79-01198

ROLE OF TURBULENT MIXING IN THE DISPERSION OF POLLUTANTS AT THE EDGE OF A LARGE LAKE,
Wisconsin Univ., Madison. Dept. of Meteorology.
For primary bibliographic entry see Field 5C.
W79-01199

QUABOAG AND QUACUMQUASIT PONDS, WATER QUALITY STUDY, APRIL 1974-APRIL 1975,
Massachusetts Water Resources Commission, Westborough. Div. of Water Pollution Control.
For primary bibliographic entry see Field 5C.
W79-01202

IMPACT OF THE SCHWARTZWALDER MINE ON THE WATER QUALITY OF RALSTON CREEK, RALSTON RESERVOIR, AND UPPER LONG LAKE.
Environmental Protection Agency, Denver, CO. Technical Investigations Branch.
For primary bibliographic entry see Field 5B.
W79-01207

THE OKEFENOKEE SWAMP WATERSHED: WATER BALANCE AND NUTRIENT BUDGETS,
Georgia Univ., Athens. Dept. of Zoology; and Georgia Univ., Athens. Inst. of Ecology.
E. J. Rykiel, Jr.
Okefenokee Ecosystem Investigations, Technical Report No. 3, University of Georgia. Ph.D. Dissertation. January 1978. 246 p, 34 fig, 42 tab, 116 ref, 3 append.

Descriptors: *Swamps, *Georgia, *Nutrient cycling, *Hydrologic budget, Wetlands, Nutrients, Potassium, Calcium, Chlorides, Model studies.

System level nutrient budgets indicate net gains in calcium and potassium and net losses for magnesium, sodium, and chloride for the entire swamp-upland system. Subsystem level nutrient budgets are in general agreement with system level budgets. The uplands show a small net gain of potassium. Net losses are indicated for the other elements. For the swamp subsystem accumulation of calcium and potassium is intensified compared to the systems budgets. The magnesium budget is shifted from a net loss to a net gain. The input of nutrients from the uplands subsystem to the swamp is very important. Potassium is the only element with greater input from precipitation than from uplands. Precipitation supplied about 25% of the calcium, 29% of the magnesium, 68% of sodium, all of the potassium, and 47% of the chloride. Streamflow accounts for both the major water and nutrient output from the watershed. (Steiner-Mass)
W79-01211

MONTHLY DETERMINATIONS OF THE CONCENTRATIONS OF SODIUM, POTASSIUM, MAGNESIUM AND CALCIUM IN THE RAIN AND POOLS OF THE SILVER FLOWE NATIONAL NATURE RESERVE.
Hull Univ. (England). Dept. of Biology.
For primary bibliographic entry see Field 2K.
W79-01212

HYDROLOGY OF THE NEVIN WETLAND NEAR MADISON, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
R. P. Novitzki.
Water Resources Investigation 78-48. June 1978. 25 p. 7 fig, 3 tab, 14 ref.

Descriptors: *Wetlands, *Wisconsin, *Hydrologic cycle, Water quality, Sediments, Nitrogen, Nutrients, Evapotranspiration, Groundwater movement, Surface runoff.

Groundwater enters the wetlands as springflow and as leakage upward through the organic wetland soils. Inflow was composed of direct precipitation (7%), surface water inflow (4%), and groundwater inflow (89%). Outflow from the wetland was composed of streamflow (92%) and evapotranspiration (8%). Some groundwater flowed beneath the wetland but did not discharge within the study area. Groundwater inflow contained 95% of the nitrogen that entered the wetland, precipitation contained 2%, and surfacewater inflow contained 3%. Sixty-six percent of the phosphorus input was from groundwater, 31% from surface water, and 3% from precipitation. The wetland retained 21% of the nitrogen and 7% of the sediment that entered it. (Steiner-Mass)
W79-01213

RELATIONSHIPS BETWEEN MINERAL SUPPLY AND GROWTH OF NARTHECIUM OSSIFRAGUM (L.) HUDS. ON MIRE ECOSYSTEMS,
Reading Univ. (England). Dept. of Agriculture; and Reading Univ. (England). Dept. of Horticulture.
R. J. Summerfield, and J. O. Rieley.
Journal of Ecology, Vol. 63, No. 2, p 643-656, July, 1975. 9 tab, 24 ref.

Descriptors: *Bogs, *Plant growth, *Regression analyses, *Standing crop, *Wetlands, Nutrients, Marsh plants, Model studies, Mathematical models, Calcium, Phosphate, *Mires, *Narthecium ossifragnum, Valley mire(Great Britain), Mineral ion supply.

Regression models relating the growth of Narthecium ossifragum to both mineral ion supply and uptake are reported. Six attributes of standing crop together with eight mineral ions in the rooting substrate and the plant itself were investigated on four mire sites over a period of one year. The investigation resulted in over 12,000 chemical analyses and 1,300 measurements of standing crop attributes. Using multiple linear regression, it was possible to reduce this data to six equations comprising a total of only 36 variables. All six equations could be interpreted in a meaningful manner and were relevant biologically. The importance of phosphate and calcium supply and uptake, together with the ionic status of the mire water and chemistry of the local precipitation, to the growth of N. ossifragum was clearly demonstrated. (Steiner-Mass)
W79-01216

THE INFLUENCE OF COLLOIDAL ORGANIC MATTER ON IRON AND IRON-PHOSPHORUS CYCLING IN AN ACID BOG LAKE,
Michigan Univ., Ann Arbor. School of Natural Resources.
For primary bibliographic entry see Field 5C.
W79-01219

PRIMARY PRODUCTION IN A SHALLOW WATER LAKE WITH SPECIAL REFERENCE TO A REED SWAMP,
Odense Univ. (Denmark). Biological Inst.
For primary bibliographic entry see Field 5C.
W79-01223

NITROGEN AND PHOSPHORUS FERTILIZATION OF AQUATIC VASCULAR PLANTS AND ALGAE IN REPLICATED PONDS. I. INITIAL RESPONSE TO FERTILIZATION,
Lawler, Matusky and Skelly, Tappan, NY; and Cornell Univ., Ithaca, NY.
For primary bibliographic entry see Field 5C.
W79-01224

ACCUMULATION OF ARSENIC IN SEDIMENTS OF LAKES TREATED WITH SODIUM ARSENITE,
Texas Univ. at Dallas, Richardson. Inst. of Environmental Sciences.
For primary bibliographic entry see Field 5B.
W79-01253

EFFECT OF ACID MINE DRAINAGE ON THE PH OF LAKE TOYA, JAPAN,
Toyama Univ. (Japan). Faculty of Science.
For primary bibliographic entry see Field 5B.
W79-01258

HIGHWAY CONSTRUCTION IMPACT ON WATER-SUPPLY LAKES,
Interprovincial Engineering Ltd., Halifax (Nova Scotia).
For primary bibliographic entry see Field 4C.
W79-01260

INTERRELATION OF FOREST AND BOG.
Akademiya Nauk SSSR, Sibirskoye Otdeleniye. 1976. P'yavchenko, N. I., Ed. Translated from USDA Forest Service.

Descriptors: *Bogs, *Forests, *Ecology, Wetlands, Peat, Productivity, Dusts, Nitrogen, Aquatic habitats, Invertebrates, *USSR.

This collection, which includes a review of station research on the bog-forest-biogenocenose, contains nine articles. In these the main features of bog formation under existing natural conditions are discussed; a description of the water regime and microclimate of dry and wet bogs is given; and the results of research on the quantity, population, and

interaction of soil invertebrates and microorganisms under the impact of seasonal changes in the chemistry of peat soils are dealt with. An attempt has been made to examine the biological productivity of forest associations on bogs and to stufdy the biologica cycle of nitrogen and other mineral elements. The role of atmospheric dust in metabolism i the bog-forest ecosystem has also been examined. The papers describe changes in the vegetation on newly reclaimed bogs and the process of establishing highly productive forests on long-reclaimed ones. (See W79-01298 thru W79-01305) (Steiner-Mass)
W79-01297

SOME RESULTS OF STATION RESEARCH ON THE INTERRELATION OF FOREST AND BOG IN WESTERN SIBERIA,
N. I. P'yavchenko.
In: Interrelations of Forest and Bog, p 1-39. 5 fig, 16 tab, 44 ref. Translated from Russian.

Descriptors: *Bogs *Drying, *Vegetation establishment, Wetlands, Peat, Dewatering, Forests, Forest management, Vegetation regrowth, Trees, Decomposing organic matter, USSR.

The drying of bogs in south Tomsk region does not bring about any obvious change in the temperature regime of the ground layer of air and the root-feeding zone of the soil that could obstruct the use of dry bogs for afforestation purposes. Lowering the subsoil water level and freeing the soil from excess water immediately improves soil aeration and favors decomposition of organic matter. This occurs as a result not only of the increased activity of soil invertebrates and microbes but also of the dominance of such organisms as accomplish a deeper process of humification and mineralization of organic remains. Reclamation by drying the soil, mainly by changing the water and air regimes, thereby helping the growth and activity of microzoocenoses and intensifying the decomposition of the peat's organic matter, brings about considerable changes in the earlier phytocenoses. The tree growth present before the drying improves; the earlier grass-moss cover degrades and converts into a cover of mesotrophic plants; consequently the open spaces of the bogs become covered with stands of trees. (See also W79-01297) (Steiner-Mass)
W79-01298

MICRO-INHABITANTS OF MARSH PEAT SOILS IN THE TOMSK REGION,
L. M. Zagural'skaya.
In: Interrelations of Forest and Bog, p 54-80, 1967. 11 tab, 21 ref. Translated from Russian.

Descriptors: *Bogs, *Marshes, *Soil fungi, *Soil bacteria, Wetlands, Peat, Fungi, Aquatic fungi, Microorganisms, Actinomycetes, Myxobacteria, Muck soils, Soil environment, Soil microbiology, Soil microorganisms, Tomsk Region(USSR).

In the marsh peat soils of low-lying and upland conditions, the total number of microorganisms changes from 92 to 7 million per g of absolutely dry peat. Most microbes live in the uppermost layer of the peat reserves (0-10 cm layer). Low-lying bogs are somewhat richer in microflora and the different groups. In respect of plant material decomposition, a leading role is played by bacteria, followed by actinomycetes and then fungi. In the soils of upper bogs, however, fungi follow bacteria in importance. Marsh soils are rich in bacteria growing on ammoniacal starch agar medium. Fluorescent bacteria dominate the group of ammonifying bacteria. Predominant among the spore-forming bacteria are Baccillus cerens in low-lying bogs and Baccillus agglomeratus in upper bogs. There are more bacteria, with luminescent colonies, in the 0-10 cm layer. The drying of marsh soils results in an increase in the quantity of actinomycetes and spore-forming bacteria. Even the mass of myxobacteria and actinomycetes among the aerobic cellulose decomposers increases. (see also W79-01297) (Steiner-Mass)
W79-01299

THE DECOMPOSITION OF SOME PEAT-FORMING PLANTS UNDER NATURAL CONDITIONS,
L. M. Zagural'skaya.
In: Interrelation of Forest and Bog, p 81-87, 1967. 3 tab, 8fig. Translated from Russian.

Descriptors: *Bogs, *Decomposing organic matter, Wetlands, Peat, Microogranisms, Detritus, USSR.

In the peat of low-lying bogs, birch leaves completely decompose within one year; mixed grasses, cedar needles, and the sedge follow birch. Sphagnum moss decomposes quite slowly. The maximum loss of dry matter for all the peat-forming plants was noted in the first 40 days; beyond that, decomposition slows down. A high count of microorganisms was observed in mixed grasses during the whole experimental period; birch and sedge leaves followed. The maximum number of microorganisms was recorded two months after beginning the experiments. (See also W79-01297) (Steiner-Mass)
W79-01300

INTERRELATION BETWEEN INSECT LARVAE AND SOIL MICROFLORA IN FOREST BOGS,
For primary bibliographic entry see Field 2G.
W79-01301

GROUP 'B' VITAMINS IN PEAT SOILS AND EXCREMENT OF INVERTEBRATES,
For primary bibliographic entry see Field 2G.
W79-01302

ROLE OF EXCREMENT OF INVERTEBRATES IN THE ACTIVATION OF MICROFLORA OF MARSH PEAT SOILS,
For primary bibliographic entry see Field 2G.
W79-01303

THE SHIFT OF BOG VEGETATION UNDER THE INFLUENCE OF DRYING,
G. M. Platonov.
In: Interrelation of Forest and Bog, p 129-140, 1967. 3 fig, 2 tab, 8 ref. Translated from Russian.

Descriptors: *Bogs, *Drainage effects, *Marsh plants, Wetlands, Peat, Dewatering, Drying, Mosses, Canals, Grasses, Amphibious plants, Cranberries, USSR.

Bog drying canals had a marked influence up to 50 m from the banks of the canal, causing small or large changes in the original plant cover. Over a patch 10-20 m wide adjoining the canals, the drying had a particularly pronounced effect. The hydrophilic types of flowering plants and the quagmire bog-sphagnum mosses were among the bog grasses eradicated. On the very dry parts of the sphagnum moss cover completely disappeared. Sedges, bogbean, sabal, and marsh bushes seemed to be more resistant to drying. The less water-loving marsh or mesophilic plants, dominated by lancet reed grass, occupied the space vacated by the other marsh plants. Ivan's tea and thorny fruiting plants from the family Compositae were common on the dry banks of the canals. Among the trees, willows, birch seedlings, and pines appeared on the edge of the canals with the exception of parts with a thick peat cover. Over the very dry surface of the bog the natural afforestation conditions were not favorable in the first year of drying due to the soil being loose and the rapid drying of the upper layer of undecomposed sedge-sphagnum waste. (See also W79-01297) (Steiner-Mass)
W79-01304

ABOUT THE AFFORESTATION OF BOGS IN TOMSK REGION,
S. P. Efremov.
In: Interrelation of Forest and Bog, p 141-173, 1967. 10 fig, 9 tab, 26 ref. Translated from Russian.

Descriptors: *Bogs, *Drying, *Vegetation establishment, Wetlands, Peat, Dewatering, Forests, Forest management, Vegetation regrowth, Birch trees, USSR.

The drying of non-forested low-lying bogs caused tree seedlings to grow comparatively faster. White birch was the pioneer specie among the afforestation plants of dried bogs. If there were pine seed sources in nearby areas, however, the bogs were occupied by pines, which mean that the birch population declined or disappeared. Due to the drying out, the fruit-bearing capacity of trees growing on the bogs before was improved. As a result, the nurseries of trees on the ridges were converted into seed-bearing populations which were vital for afforesting the dried areas with renumerative types of plants. Different types of forest were formed, depending on the dryness of the peat soil, density, thickness of the grass-moss cover and the incorporation of seeding material. The type of peat of the low-lying bog played a less important role in this process. (See also W79-01297) (Steiner-Mass)
W79-01305

THE EFFECT OF SEVERAL PHYSICAL AND CHEMICAL FACTORS UPON THE DISTRIBUTION OF BENTHIC MACROINVERTEBRATES IN DUNHAM POND, CONNECTICUT,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 5C.
W79-01330

THE MICROBIAL ECOLOGY OF THE GREAT SALT LAKE NORTH ARM,
Utah State Univ., Logan. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-01346

THE MICROBIAL ECOLOGY OF THE GREAT SALT LAKE,
Utah State Univ., Logan. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-01347

A CHEMICAL BUDGET OF A SOFT-WATER BOG LAKE: BENTHIC CONTRIBUTIONS,
Connecticut Univ., Storrs.
R. W. Kortmann.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 243, Price codes: A07 in paper copy, A01 in microfiche. MS Thesis, 1977. 117 p, 30 fig, 6 tab, 59 ref, append. OWRT A-054-CONN(5) and A-071-CONN(1), OWRT 14-31-0001-4007.

Descriptors: *Lakes, *Chemical analysis, *Water analysis, *Input-output analyses, *Sediment-water interfaces, *Lake sediments, *Phosphorus, *Nitrogen, *Silica, *Connecticut, Dunham Pond(Conn), *Soft-water bog lake, *Chemical budget, *Steady-state model, *Benthic contributions, *Ferrous iron, *Redox-active chemical, *Dialysis sampler, *Atmospheric contributions, Diurnal studies, Incubation method.

Chemical analyses of input, output, lake, and sediment interstitial waters have been performed over an annual cycle for a dimictic, soft-water bog lake. Lake budgets of total dissolved nitrogen (all forms), total phosphorus, and silica are presented and budget values are used in a steady-state model for estimating the flux between lake and sediment interstitial waters. Seasonal variations in ferrous iron concentrations, and flux calculations for ferrous iron migration from sediments by an incubation method (in situ), indicate that Fe2+ may be the major redox active chemical species poising BDEF. This additional iron (from benthic flux) has profound effects on the phosphorus content of lake waters, as indicated by diurnal studies and incubation results. Atmospheric contributions to the dissolved nitrogen and total phosphorus budgets are significant. When considered as a quantified 'point source', and included in the calculation of a phosphorus budget (after Dillon and Rigler), observed and predicted values of (P) are within 2%. Sediment interstitial water sampling methods are reviewed, and a dialysis sampler is described. This

sampler eliminates many of the problems associated with traditional sediment interstitial water sampling techniques. (de Lara-Conn)
W79-01423

A PRELIMINARY SURVEY OF THE ZOOPLANKTON AND BENTHOS OF AN ARCTIC LAKE NEAR PRUDHOE BAY, ALASKA,
Nevada Univ. System, Las Vegas. Desert Research Inst.
D. Nyquist, and J. LaPerriere.
Entomological News, Vol 84, p 227-234, 1973, 9 fig, 11 ref. A-035-ALAS(2).

Descriptors: *Benthic fauna, *Zooplankton, *Arctic, *Lakes, Surveys, *Alaska, Midges, Stoneflies, Oligocheates, *Benthos, *Prudhoe Bay area(Alas), Chironomids, Worms, Plecoptera.

A single lake on the North Slope of the Brooks Range in arctic Alaska was sampled for zooplankton and benthos. The sampling was not intensive enough to quantify the benthos, but some indication of its composition was obtained. The plankton was sampled with a five-liter Van Dorn bottle and the zooplankton separated with a 20-mesh (0.076 mm) screen. The benthos was sampled with a small (15.24 cm square) Ekman drainage. The zooplankton consisted of calanoid copepods, a single cyclopoid copepod, Daphnia sp., and Ceratium sp. The diversity of this zooplankton was calculated to be 1.06. The benthos consisted of oligocheates, Nemoura sp., Cricotopus (Paratricho-cladius) cf. alpicola Zett, Stictochironomus rosenscholdi, Paratanytarsus sp., Stictochironomus histrio type, Cryptochironomus, and Procladius (Psilotanypus) sp., and an unidentified Procladius, sp.
W79-01427

NITROGEN FERTILIZATION OF PONDS,
Auburn Univ., AL. Dept. of Fisheries and Allied Aquacultures.
For primary bibliographic entry see Field 5C.
W79-01439

ACUTE EFFECTS OF UNDERWATER CONSTRUCTION BLASTING ON FISHES IN LONG POINT BAY, LAKE ERIE,
Ontario Ministry of Natural Resources, Port Dover.
For primary bibliographic entry see Field 5C.
W79-01452

ORGANIC CONTAMINANTS,
Environmental Research Lab. Duluth, MN.
For primary bibliographic entry see Field 5C.
W79-01471

A DYNAMIC WATER QUALITY MODEL OF LAKE BIWA - A SIMULATION STUDY OF THE LAKE EUTROPHICATION,
Kyoto Univ. (Japan). Dept. of Applied Mathematics and Physics.
For primary bibliographic entry see Field 5C.
W79-01475

NUTRIENT RECOVERY FROM FARM PONDS: HYDROPONIC PLANT PRODUCTION AND OTHER MEANS, A REVIEW,
Agricultural Research Service, Durant, OK. Water Quality Management Lab.
For primary bibliographic entry see Field 5C.
W79-01477

2I. Water In Plants

THE EFFECT OF DIRUNAL VARIATION IN LIGHT AND TEMPERATURE ON THE ACETYLENE REDUCTION ACTIVITY (N2 FIXATION) OF SUBTERRANEAN CLOVER,
California Univ., Davis Dept. of Agronomy and Range Science.
J. F. Eckart.
Available from the National Technical Information Service, Springfield, VA 22161, as PB-288 655, Price codes: A03 in paper copy A01 in microfiche. MA Thesis, 1978. 25 p, 4 fig, 49 ref. (California Water Resources Center Project UCAL-WRC-W-495), OWRT-B-175-CAL(3).

Descriptors: *Clovers, *Temperature, *Light, *Diurnal, Acetylene reduction activity, Nitrogen fixation, Plant physiology, Photoperiodism, Plant physiology.

The effect of diurnal variation in light and temperature on acetylene reduction was investigated using 30 day old subterranean clover plants. Acetylene reduction showed dirunal fluctuations under constant light and 12/12 hour light/dark regimes when root and air temperature fluctuated by 7C and 14C, Respectively. In the presence of constant temperature and normal photoperiods or constant light, however, no diurnal fluctuation of actylene reduction was measured. Under both environmental regimes with constant temperature a gradual increase in acetylene reduction activity, which may have been an artifact, was observed. These patterns suggest that diurnal changes in acetylene reduction result more from fluctuating temperature than from photoperiods. (Synder-Calif, Davis)
W79-01092

CALCIFICATION AND ITS ROLE AMONG THE MACROALGAE,
California Univ., Irvine. Dept. of Ecology and Evolutionary Biology.
M. Littler.
Micronesica, Vol. 12 No 1, p. 27-41, 1976. 7 fig, 3 tab, 50 ref. (California Water Resources Center Project UCAL-WRC-W-491) OWRT-A-054-CAL(3).

Descriptors: *Calcareous soils, *Algae, Caleium carbonate, Limestone, *Calcareous algae, Bioindicators.

Calcareous algae are important components of the limestone deposits of antiquity. Such deposits are often associated with petroleum reserves and, for this reason, calcareous algae have attracted attention from a broad spectrum of workers. While nearly all have agreed that calcifying algae of modern depositional habitats are abundant, diverse and ecologically important, critical quantitative information is scarce and these organisms are in nearly every respect poorly known. Calcification is characterized as the accumulation of calcium carbonate in all physical states within or upon the thallus, including crystalline and non-crystalline aggregates and amrophous impregnation. The first portion of this paper surveys the calcium-depositing habit. Secondly, an overview of recent work on the distribution and ecology of calcareous macrophytes is developed. The last part considers the scant information on physiological mechanisms including the importance and possible functional roles of calcification. In this connection, certain aspects of research on calcium-carbonate production rates and ratios in calcareous algae are reviewed with suggestions of areas where future work is needed. (Snyde-Calif, Davis)
W79-01097

CHARACTERISTICS OF ARIZONA PONDEROSA PINE STANDS ON SANDSTONE SOILS,
Arizona Univ., Tucson. School of Renewable Natural Resources.
P. Ffolliott, and M. Baker, Jr.
U.S.D.A. Forest Service, General Technical Rpt. RM-44, 1977, Rocky Mountain Forest and Range Exp. Station, Fort Cullins, Colorado 7 p 2 fig, 1 tab, 20 ref. OWRT A-066-ARIZ(4), 14-34-0001-6003.

Descriptors: *Arizona, *Ponderosa pine trees, *Sandstones, *Sedimentary rocks, *Suspended solids, *Water yield, *Water quality, Plant growth, *Suspended sediment, *Dissolved chemical constituents, *Volcanic soils, Site index, Herbage production, Forest floor.

Physiographic, hydrologic, and biotic information was examined in a four-year study of a ponderosa pine exosystem on porous sandstone soils in north-central Arizona. Based on this information and that obtained from ponderosa pine ecosystems on soils derived from volcanic materials, the following comparisons can be made regarding products and used of the land: Annua water yield measured at the flume from sandstone soils is approximately 25% of that from volcanic soils. Physical and chemical water qualities (suspended sediment concentrations and dissolved chemical constituents) are similar on both soil types. Forest densities on the sandstone soils are less than on the volcanics, and therefore annual growth of the ponderosa pine stands on sandstone is greater because of higher individual tree growth rates. Site index is also higher on the sandstone soils; timber quality is similar on both areas. Total herbage production on the sandstone soils is less than has been estimated on the volcanics. Futhermore, herbage production on sandstone soils at a given level of tree density or depth of forest floor is less than produced on volcanic soils. (White - Arizona)
W79-01099

ASPECTS OF THE LIFE HISTORY AND GROWTH OF ACRONEURIA (CALINEURIA) CALIFORNICA IN A SIERRA FOOTHILL STREAM,
California Univ., Davis. Dept. of Land, Air and Water Resources.
C. A. Siegfried, and A. W. Knight.
Annals of the Entomological Society of America, Vol. 71, No. 1, p 149-154, January 1978. 5 fig, 23 ref. (California Water Resources Center Project UCAL-WRC-W-243).

Descriptors: *Entomology, *Aquatic insects, Life history studies, Nymphs, California, Squirrel Creek(Calif), Standing crops, Growth stages, Larval growth stage, Calineuria, Acroneuria.

Aspects of the life history and growth of Acroneuria (Calineuria) californica Banks (Plecoptera: Perlidae) were studied in Squirrel Creek, Nevada County California. Numerical standing crop ranged from 159 nymphs/m2 (in Aug. 1973) to 4 nymphs/2 (in Nov. 1973). The Nov. minimum coincided with the onset of the rainy winter season. Nymphal life was ca. 18 months. Emergence was observed from late April through June. Eggs were laid in May and June but did not begin to hatch until the following Jan. The loss of larger nymphs during winter washouts is reflected in growth curves. Annual production, obtained by the instantaneous-growth method, was 2.26 g dry weight/m2/year, with an annual turnover ratio of 4.21. Cohert turnover, calculated from the life-history instantaneous-growth rate, was estimated at 6.5. (Snyder-California)
W79-01125

RELATIONSHIPS BETWEEN MINERAL SUPPLY AND GROWTH OF NARTHECIUM OSSIFRAGUM (L.) HUDS. ON MIRE ECOSYSTEMS,
Reading Univ. (England). Dept. of Agriculture; and Reading Univ. (England). Dept. of Horticulture.
For primary bibliographic entry see Field 2H.
W79-01216

THE ECOTONE BETWEEN SPARTINA FOLISOA TRIN. AND SALICORNIA SALICORNIA VIRGINICA L. IN SALT MARSHES OF NORTHERN SAN FRANCISCO BAY, I. BIOMASS AND PRODUCTION,
California Univ., Berkeley. Dept. of Botany.
For primary bibliographic entry see Field 2L.
W79-01217

THE ECOTONE BETWEEN SPARTINA FOLIOSA TRIN. AND SALICORNIA VIRGINICA L. IN SALT MARSHES OF NORTHERN SAN FRANCISCO BAY: II. SOIL WATER AND SALINITY,
California Univ., Berkeley. Dept. of Botany.

For primary bibliographic entry see Field 2L.
W79-01218

EFFECT OF SOIL APPLICATION OF DAIRY MANURE ON GERMINATION AND EMERGENCE OF SOME SELECTED CROPS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5C.
W79-01236

NUTRIENT FLUXES IN PRECIPITATION, THROUGHFALL, AND STEMFLOW IN AN OAK-HICKORY FOREST,
Illinois Univ. at Urbana-Champaign. Dept. of Forestry.
G. L. Rolfe, M. A. Akhtar, and L. E. Arnold.
Water Resources Bulletin, Vol. 14, No. 5, p 1220-1226, October 1978. 4 tab, 25 ref.

Descriptors: *Nutrients, *Precipitation(Atmospheric), *Throughfall, *Stemflow, *Deciduous forests, *Illinois, Canopy, Ecosystems, Nitrogen, Phosphorus, Cycling nutrients, Oak trees, Hickory trees, Dusts, Litterfall.

Nutrient fluxes in precipitation, throughfall, and stemflow were studied in an oak-hickory forest in southern Illinois for a three-year period beginning in 1973. Nutrient inputs in these water related pathways were approximately one-half those of litterfall, a major nutrient return mechanism. Considering these water-carried nutrients (116 kg/ha/yr), 38% was contributed by precipitation, 35% by throughfall, and approximately 27% by stemflow. Although the total nutrient input is only one-half that of litterfall, the net impact of short-term nutrient requirements is considerable because of the immediate availablity of water-carried nutrients. Nutrient inputs in litter represent a delayed return mechanism because of the relatively slow decomposition process. (Visocky-ISWS)
W79-01246

HABITAT USE AND HOME RANGE OF MALLARDS BREEDING IN MINNESOTA,
Minnesota Univ., St. Paul. Dept. of Ecology and Behavioral Biology.
D. S. Gilmer, I. J. Ball, L. W. Cowardin, J. H. Riechmann, and J. R. Tester.
Journal of Wildlife Management, Vol. 39, No. 4, p 781-789, October, 1975. 2 tab, 38 ref.

Descriptors: *Mallard ducks, *Habitats, *Wetlands, *Home ranges, Bogs, Waterfowl, Ducks, *Minnesota, Lakes, Swamps, Reproduction, Telemetry.

Telemetry techniques were used to study habitat use and home range of 12 drake and 12 hen mallards (Anas platyrhyanchos) in the forrested region of north-central Minnestoa during the 1968-72 breeding seasons. Cricumneutral bogs and seasonal wetlands were the most frequently used communities; the lakeshore communities most used were sand-gravel, overhanging brush, and bog mat. Based on the availability of habitat, the highest preference shown was for the seasonal community and the least for the softwood swamp; however, all communities were used to some extent during the breeding season. Lakeshore was always among the habitats most frequently used by pairs. Twelve nests were found, none in nonpermanent wetlands and three in upland forest sites. Mean home range was 210 ha for hens and 240 for drakes. (Stihler-Mass)
W79-01287

GROWTH AND MORTALITY OF LITTORINA IRRORATA SAY IN THREE NORTH CAROLINA MARSHES,
North Carolina Univ. at Chapel Hill. Dept. of Zoology.
For primary bibliographic entry see Field 2L.
W79-01289

GROWTH AND RESOURCE ALLOCATION RESPONSES OF SPARTINA ALTERNIFLORA LOISEL TO THREE LEVELS OF NH SUB 4-N, FE, AND NACL IN SOLUTION CULTURE,
Georgia Univ., Athens. Dept. of Botany.
B. L. Haines, and E. L. Dunn.
Botanical Gazette, Vol. 37, No. 3, p 224-230, 1976. 1 fig, 1 tab, 33 ref.

Descriptors: *Salt marsh, *Marsh plants, *Ammonia, *Salinity, *Plant growth, *Soil-water-plant relationships, Wetlands, Marshes, Growth rates, Grasses, Iron, Plant growth regulators, Root development.

Seedlings of Spartina alterniflora were grown for eleven weeks in a solution culture factorial experiment each of NH sub 4-N, Fe, and NaCl. Plant height, total dry weight, rhizome length, rhizome weight, and root weight were significantly affected by NH sub 4-N and by NaCl but not by Fe concentrations. In general, increasing NH sub 4-N promoted growth except at the highest salinity. Shoot-to-root ratios indicated decreased resource allocation to root production with increase of both NH sub 4-N and NaCl. Shoot-to-rhizome weight ratios showed allocation to rhizomes was little affected by salinity but was favored by increased amounts of NH sub 4-N and Fe. For the three factors studies, results suggested that future field studies of s. alterniflora should focus on relations of process rates to variations in concentrations of nitrogen and of salt rather than or iron. (Steiner-Mass)
W79-01294

PRIMARY PRODUCTION OF EDAPHIC ALGAL COMMUNITIES IN A DELAWARE SALT MARSH,
Delaware Univ., Newark. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W79-01296

INTERRELATION OF FOREST AND BOG.
Akademiya Nauk SSSR, Sibirskoye Otdeleniye.
For primary bibliographic entry see Field 2H.
W79-01297

SOME RESULTS OF STATION RESEARCH ON THE INTERRELATION OF FOREST AND BOG IN WESTERN SIBERIA,
For primary bibliographic entry see Field 2H.
W79-01298

THE DECOMPOSITION OF SOME PEAT-FORMING PLANTS UNDER NATURAL CONDITIONS,
For primary bibliographic entry see Field 2H.
W79-01300

THE SHIFT OF BOG VEGETATION UNDER THE INFLUENCE OF DRYING,
For primary bibliographic entry see Field 2H.
W79-01304

ABOUT THE AFFORESTATION OF BOGS IN TOMSK REGION,
For primary bibliographic entry see Field 2H.
W79-01305

TRANSPLANTATION OF SALT MARSH VEGETATION. II. GEORGETOWN, SOUTH CAROLINA,
Saint John's Univ., Jamaica, NY. Dept. of Biology.
For primary bibliographic entry see Field 2L.
W79-01306

ULTRASTRUCTURE OF THE BLUE-GREEN ALGA ANACYSTIS NIDULANS INFECTED WITH AS-1 VIRUS,
California Univ., Riverside. Dept. of Plant Pathology.
For primary bibliographic entry see Field 5C.
W79-01334

STANDING CROPS OF MARSH VEGETATION OF TWO TRIBUTARIES OF CHESAPEAKE BAY,
Maryland Univ., Solomons. Chesapeake Biological Lab.
For primary bibliographic entry see Field 2L.
W79-01433

2J. Erosion and Sedimentation

DISTRIBUTION OF AUTOTROPHIC NITRIFYING BACTERIA IN A POLLUTED RIVER (THE PASSAIC),
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Environmental Science.
For primary bibliographic entry see Field 5B.
W79-01007

DISTRIBUTION OF TRACE METALS AND SEDIMENTS IN ESTUARIES OF THE KUM RIVER AND THE MANKYUNG RIVER,
Seoul National Univ. (Republic of Korea). Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W79-01014

UPTAKE AND RELEASE OF PETROLEUM BY INTERTIDAL SEDIMENTS AT PORT VALDEZ, ALASKA,
Alaska Univ., Fairbanks. Inst. of Marine Science.
For primary bibliographic entry see Field 5B.
W79-01022

SAND TRANSPORT MODEL OF BARCHAN DUNE EQUILIBRIUM,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
A. D. Howard, J. B. Morton, M. Gad-El-Hak, and D. B. Pierce.
Sedimentology, Vol. 25, No. 3, p 307-337, June 1978. 13 fig, 2 tab, 33 ref. NASA NGR-47-005-172.

Descriptors: *Dunes, *Model studies, *California, *Wind erosion, Mathematical models, Geomorphology, Aeolian soils, Movement, Shape, Size, Dune sands, Sediment transport, Analytical techniques, Equations, On-site investigations, Deposition(Sediments), Erosion rates, Flow, *Salton Sea(California), *Barchan dunes.

Erosion and deposition over a barchan dune near the Salton Sea, California, was modelled by bookkeeping the quantity of sand in saltation following streamlines of transport. Field observations of near-surface wind velocity and direction plus supplemental measurements of the velocity distribution over a scale model of the dune were combined as input to Bagnold-type sand-transport formulas corrected for slope effects. A unidirectional wind was assumed. The resulting patterns of erosion and deposition compare closely with those observed in the field and those predicted by the assumption equilibrium (downwind translation of the dune without change in size or geometry). Discrepancies between the simulated results and the observed or predicted erosional patterns appear to be due largely to natural fluctuation in the wind direction. Although the model includes a provision for a lag in response of the transport rate to downwind changes in applied shear stress, the best results are obtained when no delay is assumed. The shape of barchan dunes is a function of grain size, velocity, degree of saturation of the oncoming flow, and the variability in the direction of the oncoming wind. Smaller grain size or higher wind speed produce a steeper and more blunt stoss-side. Low saturation of the inter-dune sandflow produces open crescent-moon-shaped dunes, whereas high saturation produces a whaleback form with a small slip face. Dunes subject to winds of variable direction are blunter than those under unidirectional winds. A need exists for comprehensive field measurements of sand flow (quantity, grain size, and vertical distribution) and the associated velocity profiles at

many points on and upwind from natural dunes in order to refine the model presented. (See also W73-06244) (Humphreys-ISWS)
W79-01043

BED FORMS AND STRATIFICATION TYPES OF MODERN GRAVEL MEANDER LOBES, NUECES RIVER, TEXAS,
Texas Univ. at Austin. Bureau of Economic Geology.
T. C. Gustavson.
Sedimentology, Vol. 25, No. 3, p 401-426, June 1978. 20 fig, 1 tab, 36 ref.

Descriptors: *River beds, *Texas, *Meanders, *On-site investigations, Streambeds, Shape, Distribution patterns, Dunes, Sediment transport, Gravels, Stratigraphy, Alluvial channels, Hydrologic aspects, On-site data collections, Bed load, Flow, Discharge(Water), Gradation, Banks, Sediments, Particle size, *Nueces River(Texas), Gravel bars, Meander lobes.

All major streams draining the southwestern flank of the Edwards Plateau in south-central Texas transport large volumes of gravel and sandy muddy gravel and are developing meander lobe sequences consisting predominantly of coarse gravel. The largest of these streams, the Nueces River, has a sinuosity index of 1.3 and an average stream surface slope of 1.8 m/km in the study area. Stream discharge is variable and has ranged from no flow to more than 17,000 cu m/s. Mean clast b-axis length for the 10 largest clasts at 13 sample sites ranged from 2.5 to 10.8 cm. Velocities of 2.7-4.4 m/s one meter above the stream bed are required to transport these clasts. Stream velocities of these magnitudes occur about once in 8 years when the discharge exceeds 3,300 cu m/s. Mean grain size of alluvium ranges from 1.2 to 3.4 cm. At a flow depth of 1 m, sediment of this size has a critical erosion velocity of 1.8-3 m/s. Velocities of this magnitude occur about once in two years when discharge exceeds 340 cu m/s. Under these conditions flow is subcritical, with critical shear stresses on depositional surfaces ranging from 6.4 to 12.7 kg/sq m. Gravel clasts are imbricated, and channel bed forms are predominantly transverse gravel bars with slip faces ranging up to 2 m high and wavelengths in excess of 100 m. Stratification includes graded planar crossbeds and horizontal beds. Lower lateral accretion face sediments are also predominantly transverse bars; upper lateral accretion face deposits occur as longitudinal gravel ridges deposited in the lee of vegetation and, less commonly, as chute bars. Near the upper limit of meander lobes where vegetation is heavy, mud and muddy sand occur as overbank deposits; in these deposits, sedimentary structures other than desiccation cracks are rare. (Humphreys-ISWS)
W79-01044

FIELD STUDY OF SEDIMENT TRANSPORT CHARACTERISTICS OF THE MISSISSIPPI RIVER NEAR FOX ISLAND (RM 355-6) AND BUZZARD ISLAND (RM 349-50),
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
T. Nakato, and J. F. Kennedy.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A045 244, Price codes: A05 in Paper copy, A01 in Microfiche. 92 p, 46 fig, 6 tab, 6 ref.

Descriptors: *Sedimentation, *Sediment transport, *Mississippi River, *Sampling, Surveys, On-site investigations, On-site data collections, Discharge(Water), Velocity, Flow, River flow, Sediments, Sediment distribution, Suspended solids, Shoals, Bed load, Distribution patterns, Data processing, Regression analysis, Rivers, Hydrology.

A field study was conducted in order to obtain a better understanding of the flow and sediment transport mechanisms responsible for the recurrent shoaling that has been experienced in the vecinities of Fox Island (between RM 355 and RM 356) and Buzzard Island (between RM 349 and RM 350) in Pool 20 between Keokuk, Iowa, and Canton, Missouri, in the Mississippi River. Three sets of detailed data on transverse and streamwise distributions of flow velocity, suspended sediment discharge, bedload discharge, bed-material properties, and flow depth were otained for the high, intermediate, and low river stages during the period between May and September, 1976. The field data were used to establish empirical relationships between the bed-load discharge, Q sub B (tons/day); and the water discharge, Q (cfs); and mean velocity, U (ft/s) in the study reaches. It was found that Q sub B varies as approximately to 4th power of U or Q. The suspended load discharge, Q sub S (tons/day), was found to vary as the square, roughly, of Q. The unit total load, Q sub T (tons/ft/s), was found to vary as the square, approximately, of the unit water discharge, q (cfs/ft). In the vicinity of Buzzard Island reach, the Mississippi River flow was found to bifurcate, with in excess of 25% of the water discharge passing through the secondary side channel. This flow bifurcation and the attemdant velocity reduction downstream from it in the main channel were found to be responsible in large measure for the current shoaling in this reach. (Sims-ISWS)
W79-01065

SIMULATION OF SOIL EROSION IN THE PALOUSE PRAINE OF THE PACIFIC NORTHWEST,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4D.
W79-01087

SEDIMENTATION AND MICROBIAL METABOLISM IN A SHALLOW ESTUARY,
Connecticut Univ., Storrs. Inst. of Water Resources.
J.D. Buck.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-288 652, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, 1978. 27 p, 13 fig, 5 tab, 12 ref. OWRT A-069-CONN(1), 14-31-001-6007.

Descriptors: *Sedimentation, *Assay, *Organic matter, Lotic environment, *Connecticut, Estuaries, Microbial degradation, Bioassay, *Copps Brook watershed(Conn), Estuarine environment, *Microbial metabolism, *Sensitive tetrazolium, Salt assay, Total biological metabolism, Shallow estuary, Particulate organic matter, Organic supply, Budget.

A pristine, forested coastal watershed (18 km) in southern New England was studied for three years to determine (1) the effect of a small (22 ha) drinking water reservior on nutrient and water runoff, and (2) the relative importance of the watershed in supplying organic sediment to the receiving esturay (29 ha). Organc and inorganic freshwater runoff data were supplemented with estuarine sedimentation rate data to construct a first-order organic supply budget for the estuary. The reservoir system retained significant amounts of dissolved and particulate organic carbon and N03-N, but O-P04-P runoff was unaffected. Lentic conditions in the reservior allowed for substantial amounts of primary production by photoplankton which reduced N03-N export to the estruary by a third. Freshwater delivery of particulate organic matter to the estuary equaled the amount from marine sources which was collected in sediment traps (c.23 mol organic carbon/sq m/ yr.). Total deposition of organic material in the estruary was estimated to range between 120 and 300 mol/sq m/ yr, mostly from estuarine primary production. Investigations of the chemistry of the interstitial pore waters of the estuarine sediments showed that organic matter deposition rates and the ambient hydrologic regime induce facultative and anaerobic metabolism by the microflora. A sensitive assay of total biological metabilism using tetrazolium salts is being developed to (1) obtain estimates of aerobic and anaerobic metabolism and, (2) complete a first-order organic matter supply and demand model for this aquatic/marine system. (Matson-Conn)
W79-01091

GEOCHEMISTRY OF MERCURY IN PALOS VERDES SEDIMENTS,
Southern California Coastal Water Research Project, El Segundo, California.
For primary bibliographic entry see Field 5B.
W79-01250

METALS FROM URBAN RUNOFF IN DATED SEDIMENTS OF A VERY SHALLOW ESTUARY,
California Univ., Irvine. School of Engineering.
For primary bibliographic entry see Field 5A.
W79-01251

ACCUMULATION OF ARSENIC IN SEDIMENTS OF LAKES TREATED WITH SODIUM ARSENITE,
Texas Univ. at Dallas, Richardson. Inst. of Environmental Sciences.
For primary bibliographic entry see Field 5B.
W79-01253

THE CASE OF THE SHRINKING CHANNELS-THE NORTH PLATTE AND PLATTE RIVERS IN NEBRASKA,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 4A.
W79-01380

DISSOLVED-SOLIDS CONCENTRATIONS AND LOADS IN FLORIDA SURFACE WATERS,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01382

A CHEMICAL BUDGET OF A SOFT-WATER BOG LAKE: BENTHIC CONTRIBUTIONS,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 2H.
W79-01423

2K. Chemical Processes

DONNAN DIALYSIS ENRICHMENT OF CATIONS,
Southern Illinois Univ. at Carbondale. Dept. of Chemistry and Biochemistry.
J. A. Cox, and J. E. DiNunzio.
Analytical Chemistry, Vol. 49, No. 8, p 1272-1274, July 1977. 2 fig, 2 tab, 9 ref. OWRT A-087-ILL(1).

Descriptors: *Dialysis, Copper, Chemical analysis, Water analysis, *Cations, *Donnan dialysis, Spectroscopy, Ions, Ion transport, Analytical techniques, *Ion selective membranes, *Atomic absorption spectroscopy, Chemical extraction.

Factors which influence the rate of cation enrichment by Donnan dialysis have been identified. The rate was found to depend upon both the identity of the cation and the ionic strength of the receiver electrolyte. with receiver electrolytes selected as salts of cations from Periodic Groups IA - IIA, the rate of enrichment varied as follows: increased with group number and increased with smaller atomic number within a group. Thus, A1 (III) was selected as the receiver cation; to minimize the possibility of hydroxide precipitation, a 10-3M A1(III)/0.2M Mg(II) mixture was generally employed. The addition of Mg was required because the enrichment rate increases with receiver ionic strength and because the maximum sample ionic strength which permits Donnan dialysis enrichment depends upon that of the receiver. With the above receiver, 10-fold enrichments of Cu(II) samples were accomplished in 30 minutes; the enrichment was independent of sample ionic strength up to 0.01; and the rate of enrichment was directly proportional to Cu concentration over the range 1.4x10-7-2.5x10-5M. With a two hour preconcentration the detectability was 3x10-8M by atomic absorption spectrometry. Factors which affect the

precision were also identified. Typical relative standard deviations were 2% when an internal standard was used.
W79-01011

GEOCHEMICAL IMPLICATIONS OF SUMMER MONSONNAL RAINWATER COMPOSITION OVER INDIA,
Bhabha Atomic Research Center, Bombay (India). Div. of Radiological Protection.
R. Sequeira, and D. Kelkar.
Journal of Applied Meteorology, Vol. 17, No. 9, p 1390-1396, September 1978. 6 fig, 3 tab, 25 ref.

Descriptors: *Monsoons, *Rainfall, *Salts, *Water chemistry, Sampling, Surveys, Chemical analysis, Rainfall, Rain water, Sodium chloride, Sodium, Potassium, Calcium, Magnesium, Chlorides, Sulfates, Chemicals, Chemistry of precipitation, Meteorology, *India.

Rainwater was sampled from 10 coastal and inland stations over India during the entire monsoon period of 1975. Major sea salt constituents were determined analytically. Sea salt deposition values based on the sodium content were presented for each station. It is estimated that during a monsoon period some 4,000,000 tons of sea salt are likely to be transported into the country. With the exception of calcium, the overall seasonal proportions of sea salt constituents in coastal rainwater indicate either minor or no differences as compared with the composition of seawater. A high excess of calcium was found in all rainwater samples. Average excess at the coast was found to be 400-1000% over that expected on the basis of the sodium content. The calcium is uniformly distributed over the country, with average concentration of 1.1 mg/l for the present network of sampling stations. It was proposed that the excess calcium is predominantly of desert origin and is mostly from Arabia and/or Iran. Excesses of potassium and sulfate and depletion of chloride were observed in inland rainwater. The two excesses were believed to be of local continental origin. (Sims-ISWS)
W79-01039

AN IMPROVED HYDRAZINE REDUCTION METHOD FOR THE AUTOMATED DETERMINATION OF LOW NITRATE LEVELS IN FRESHWATER,
Department of Scientific and Industrial Research, Taupo (New Zealand). Ecology Div.
For primary bibliographic entry see Field 5A.
W79-01042

THE DENSITY OF SEAWATER SOLUTIONS AT ONE ATMOSPHERE AS A FUNCTION OF TEMPERATURE AND SALINITY,
Rosenstiel School of Marine and Atmospheric Science, Miami, FL.
F. J. Millero, A. Gonzales, and G. K. Ward.
Available from the Technical Information Service, Springfield, VA 22161 as AD-A029 088. Price codes: A03 in paper copy, A01 in microfiche.
Journal of Marine Research, Vol. 34, No. 1, p 61-93, February 23, 1976. 6 fig, 11 tab, 52 ref. ONR N00014-75-C-0173, NSF GA-40532.

Descriptors: *Density, *Sea water, *Salinity, *Physical properties, *Analytical techniques, *Temperature, Specific gravity, Properties, Chemical properties, Water temperature, Saline water, Pressure, Water quality, Oceanography, Atmospheric pressure, Magnetic float densimeter.

The relative density of diluted and evaporated standard seawater solutions was determined at one atmosphere with a magnetic float densimeter and a suspension balance from 0.5 to 40 parts per thousand salinity and 0 to 40C. Tabulated results of the relative densities were shown. (Henley-ISWS)
W79-01064

QUANTITATIVE DETERMINATION OF QUATERNARY AMMONIUM BASES (QAB) IN WATER AND WASTEWATER BY THIN LAYER CHROMATOGRAPHY,
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
For primary bibliographic entry see Field 5A.
W79-01070

SCALING AND CORROSION IN AN EXPERIMENTAL GEOTHERMAL POWER PLANTS,
San Diego Gas and Electric Co., CA.
For primary bibliographic entry see Field 3C.
W79-01106

ELECTRON SPIN RESONANCE ANALYSIS OF SEMIQUINONE FREE RADICALS OF AQUATIC AND SOIL FULVIC AND HUMIC ACIDS,
New Hampshire Univ., Durham. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W79-01133

MONTHLY DETERMINATIONS OF THE CONCENTRATIONS OF SODIUM, POTASSIUM, MAGNESIUM AND CALCIUM IN THE RAIN AND POOLS OF THE SILVER FLOWE NATIONAL NATURE RESERVE.
Hull Univ. (England). Dept. of Biology.
D. J. Boatman, P. D. Hulme, and R. W. Tomlinson.
Journal of Ecology, Vol. 63, No. 3, p 903-912, November, 1975. 3 fig, 4 tab, 10 ref.

Descriptors: *Bogs, Monthly, *Nutrient cycles, *Seasonal, Wetlands, Peat, Sodium, Magnesium, Calcium, Sodium, Silver Flowe National Nature Preserve(Great Britain), Craigeazle Bog(Great Britain), Brishie Bog(Great Britain), Ombrotrophic mires.

The concentrations of sodium, magnesium, potassium, and calcium in the rain and in several deep pools, and in the pH of the pools, were measured at monthly intervals on two ombrotrophic mires of the Silver Flowe series. The annual inputs of each ion have been calculated and it is considered that the results for Craigeazle bog are more representative of the area as a whole than those of Brishie bog. Considerable variations in the concentration of the ions were found both between pools and, for mean values, from month to month. For certain ions, there were also marked differences between the pools and the rain, particularly in summer. Marked differences in the concentration of potassium were found between pools containing large amounts of Sphagnum spp. and those containing only small amounts. From the data the proportions of each ion absorbed by the peat and absorbed by the plants have been estimated. The sequence, in order of increasing removal from the percolating water, is found to be Na<Mg<K, Ca. (Steiner-Mass)
W79-01212

INLAND MANGROVES AND WATER CHEMISTRY, BARBUDA, WEST INDIES,
Cambridge Univ. (England). Dept. of Geography.
D. R. Stoddart, G. W. Bryan, and P. E. Gibbs.
Journal of Natural History, Vol. 7, No. 1, p 33-46, January-February, 1973. 6 fig, 1 tab, 39 ref.

Descriptors: *Mangrove swamps, *Ecological distribution, *Water chemistry, Swamps, Wetlands, Calcium, Strontium, Sodium, Potassium, Magnesium, Barbuda(West Indies).

Mangrove vegetation, comprising not only Laguncularia and Conocarpus, but also a closed woodland of Rhizophora, is found in inland situations in Barbuda having no connection with the sea and associated with geological and geomorphic features of either late Pleistocene or early Holocene age. These mangroves are associated with brackish water. Analyses show lowered concentrations of sodium, potassium and magnesium and higher concentrations of calcium and strontium compared with sea water having the same chloride content. The higher calcium and strontium concentrations probably result from diagenetic changes in the limestone substrate. (Stihler-Mass)
W79-01215

ION EXCHANGE MEMBRANE METHODS FOR CONTINUOUS REMOVAL OF IONS FROM WATER AND TRACE CHEMICAL ANALYSIS,
Southern Illinois Univ., Carbondale. Dept. of Chemistry and Biochemistry.
For primary bibliographic entry see Field 5A.
W79-01327

EVALUATION OF MICROMOLAR COMPLEXIMETRIC TITRATIONS FOR THE DETERMINATION OF THE COMPLEXING CAPACITY OF NATURAL WATERS,
North Carolina, State Univ. at Raleigh. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W79-01344

DETERMINATION OF THE COMPLEXING CAPACITY OF NATURAL WATER BY COBALT (III) COMPLEXATION,
North Carolina State Univ. at Raleigh. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W79-01345

DISSOLVED-SOLIDS CONCENTRATIONS OF WATER IN THE NIAGARA AQUIFER, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01369

AN AUTOMATED PROCEDURE FOR THE SIMULTANEOUS DETERMINATION OF SPECIFIC CONDUCTANCE AND PH IN NATURAL WATER SAMPLES,
Geological Survey, Lakewood, CO. Water Resources Div.
D. E. Erdmann, and H. E. Taylor.
Analytica Chimica Acta, Vol 99, p 269-274, 1978. 3 fig, 3 tab, 5 ref.

Descriptors: *Water analysis, *Hydrogen ion concentration, *Specific conductivity, *Analytical techniques, *Instrumentation, Laboratory tests, Evaluation.

An automated, continuous-flow system is utilized to determine specific conductance and pH simultaneously in natural waters. A direct electrometric procedure is used to determine values in the range pH 4-9. The specific conductance measurements are made with an electronically modified, commercially available conductivity meter interfaced to a separate module contaning the readout control devices and printer. The system is designed to switch ranges sutomatically to accommodate optimum analysis of widely varying conductances. Thirty samples per hour can be analyzed. Comparison of manual and automated procedures for 40 showed that the average differences were 1.3 percent for specific conductance and 0.07 units for pH. The relative standard deviation for 25 replicate values for each of five samples was significantly less than 1 percent for the specific conductance determination; the standard deviation for the pH determination was < or = 0.06 pH units. (Woodard-USGS)
W79-01374

SEASONAL VARIATION IN PCO2 AND C-13 CONTENT OF SOIL ATMOSPHERE,
Geological Survey, Idaho Falls, ID. Water Resources Div.
For primary bibliographic entry see Field 2F.
W79-01387

TRICHLOROFLUOROMETHANE, A NEW HYDROLOGIC TOOL FOR TRACING AND DATING GROUND WATER,
Indiana Univ. at Bloomington.
For primary bibliographic entry see Field 2F.

W79-01422

THE SLOPE OF GRAN'S PLOT: A USEFUL FUNCTION IN THE EXAMINATION OF PRECIPITATION, THE WATER-SOLUBLE PART OF AIRBORNE PARTICLES, AND LAKE WATER,
For primary bibliographic entry see Field 5A.
W79-01474

2L. Estuaries

CHANGES IN SUBMERGED AQUATIC MACROPHYTE POPULATIONS AT THE HEAD OF CHESAPEAKE BAY, 1958-1975,
Florida Univ., Gainsville, FL. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5C.
W79-01030

WIND EFFECTS ON SURFACE TO BOTTOM FRONTS,
Woods Hole Oceanographic Institution, MA.
G. T. Csanady.
Journal of Geophysical Research, Vol. 83, No. C9, p 4633-4640, September 20, 1978. 11 fig, 7 ref.

Descriptors: *Water circulation, *Winds, *Lake Ontario, *Lakes, *New England, *Continental shelf, Model studies, Mathematical models, Coasts, Tidal waters, Water temperature, Density, Salinity, Freshwater, Saline water, On-site investigations, Oceanography, Limnology, Fronts(Oceanic), Density fronts.

In nearshore regions, water of reduced density is frequently present owing to freshwater influx or spring heating. Under some circumstances, light nearshore water is confined to one side of a density front, extending from surface to bottom, and is called 'spring thermocline' or 'shelf edge front'. The shape and permanency of this front are affected by wind stress, which may interfere with the momentum balance in a direction parallel to the front and cause geostrophic adjustment motions normal to the front. A simple geostrophic adjustment theory elucidated some of the more important effects of wind on such fronts. Winds opposing the geostrophic flow above the inclined front tend to flatten its shape and eventually destroy the front, sometimes causing the formation of a surface 'lens' or 'bubble'. Comparison with observations from Lake Ontario and from the New England continental shelves showed that the theory gives a realistic first-order description of frontal behavior. (Sims-ISWS)
W79-01045

TRACE METAL ENHANCEMENT IN THE BIOTIC AND ABIOTIC COMPONENTS OF AN ESTUARINE TIDAL FRONT,
Delaware Univ., Lewes. Marine Studies Complex.
For primary bibliographic entry see Field 5B.
W79-01046

SOME OBSERVED STATISTICAL PROPERTIES OF SMALL SCALE TURBULENCE,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
J. R. Wilson.
Mauscript Report Series No. 44, 1977. 125 p, 86 fig, 7 tab, 24 ref, 2 apend.

Descriptors: *Turbulence, *Turbulent flow, *Theoretical analysis, *On-site data collections, On-site investigations, Data collections, Mathematical models, Waves(Water), Flow, Instrumentation, Filters, Equations, Energy, Shores, Shalow water, Estuaries, *Small scale turbulence.

This study investigated the characteristics of the small scales of turbulent velocity and temperature fields in the atmospheric boundary layer, particularly distributions of the spatial derivatives, behavior of the structure functions, and the nature of the interactions leading to inertial transfer of energy between the larger and smaller scales of the turbulent flow. Observed statistical distributions of the differentiated downstream and X-wire signals did not conform accurately to the theoretically predicted logarithmic normal model, although there was good general agreement. Distribution of the sum of the squares of the differentiated X-wire signals was described well by the normal model. Temperature derivatives followed the log normal distribution better than did the velocity derivatives, but a poor signal-to-noise ratio prevented conclusive results. Observed structure functons conformed to present theory for the velocity and temperature data. Inertial transfer of energy in the downstream component behaved as would be expected intuitively. Specifically, net rate of arrival of energy was zero for wavenumbers where viscosity was unimportant, and positive where viscosity was important. Interactions of scale sizes differing by more than a factor of 10 in size did not contribute significantly to the energy transfers. Flow of downstream energy was from larger-to-smaller scale sizes for horizontal scales as large as 20 m. The mean inertial transfer of energy associated with interactions between downstream components only, was approximately equal to the mean rate of energy loss due to the corresponding dissipation term. (Sims-ISWS)
W79-01055

SEDIMENTATION AND MICROBIAL METABOLISM IN A SHALLOW ESTUARY,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 2J.
W79-01091

LIMNOLOGICAL CHARACTERISTICS OF THE POTOMAC ESTURY,
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5C.
W79-01195

PERSISTENT BLOOMS OF SURF DIATOMS ALONG THE NORTHWEST COAST,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W79-01200

NITROGEN ACCRETION, AND THE NATURE AND POSSIBLE SIGNIFICANCE OF N2 FIXATION (ACETYLENE REDUCTION) IN A NOVA SCOTIAN SPARTINA ALTERNIFLORA STAND,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-01214

INLAND MANGROVES AND WATER CHEMISTRY, BARBUDA, WEST INDIES,
Cambridge Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 2K.
W79-01215

THE ECOTONE BETWEEN SPARTINA FOLISOA TRIN. AND SALICORNIA SALICORNIA VIRGINICA L. IN SALT MARSHES OF NORTHERN SAN FRANCISCO BAY, I. BIOMASS AND PRODUCTION,
California Univ., Berkeley. Dept. of Botany.
B. E. Mahall, and R. B. Park.
Journal of Ecology, Vol. 64, No. 2, p 421-433, July, 1976. 3 fig, 4 tab, 47 ref.

Descriptors: *Salt marshes, *Rooted aquatic plants, *Ecotone, Biomass, Productivity, Tidal marshes, Standing crop, Bay, Spartina, Salicornia, *San Francisco Bay.

Measurements of above-ground and below-ground standing crop, and seasonal production of Spartina foliosa and Salicornia virginica were made in 1972 along 2 transects crossing the ecotone between the 2 species at mean high water level at Mare Island and the Petaluma River in the San Pablo area of San Francisco. The above-ground standing crop and production of Spartina declined in all respects as the ecotone was approached. The above-ground standing crop and production of Salicornia also decreased toward the ecotone, but are Mare Island, Salicornia was more productive per unit biomass or per stem in the Spartina zone than in the Salicornia zone. Living rhizomes and roots of Salicornia were found primarily in the upper 15 cm of soil. Living rhizomes and roots of Spartina were distributed throughout the soil profile but tended to be absent from the upper 15 cm in the Salicornia zone. Total standing crop and production, including both species, decreased to a minimum at the middle of the ecotone. It appears that the zonation is dependent on physical factors and physiological resonses rather than on interspecific competitive effects. (See also W79-01218)(Maroncelli-Mass)
W79-01217

THE ECOTONE BETWEEN SPARTINA FOLIOSA TRIN. AND SALICORNIA VIRGINICA L. IN SALT MARSHES OF NORTHERN SAN FRANCISCO BAY: II. SOIL WATER AND SALINITY,
California Univ., Berkeley. Dept. of Botany.
B. E. Mahall, and R. B. Park.
Journal of Ecology, Vol. 64(3), p 793-809, November, 1976. 4 fig, 4 tab, 47 ref.

Descriptors: *Salt marshes, *marsh plants, *Distribution patterns, *Salinity, Wetlands, Tidal marshes, Ecological distribution, Soil water, Halophytes, California, *San Francisco Bay.

Measurements were made of soil water and salt content along the ecotone between Spartina foliosa and Salicornia virginica. During the rainless late spring and summer growing season, the apparent salinity in the upper littoral Salicornia zone at a depth of 0-35 cm was of the order of 0.25 m-osm./g water greater than that in the mid-littoral Spartina zone. The differences between the zones became insignificant during the winter rainy season, when the plants were essentially dormant. Hydroponic experiments show that S. foliosa plants are less tolerant of rapid salinity changes, and their growth is much more inhibited by higher root medium salinities than S. virginica plants. The growth of the Spartina was severely reduced at salinities above 0.6 m-osm./g water, whereas the growth of Salicornia was not significantly inhibited by salinities up to 1.4 m-osm./g water and its roots seemed to be very effective at excluding ions supplied in root media with high NaCl contents. Spartina was relatively ineffective at excluding such ions and its water use efficiency declined markedly with increasing salinity while that of Salicornia increased slightly. (See also W79-01217)(Steiner-Mass)
W79-01218

MAN'S IMPACT ON THE BARRIER ISLANDS OF NORTH CAROLINA,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 6G.
W79-01220

PRODUCTION AND DYNAMICS OF EXPERIMENTALLY ENRICHED SALT MARSH VEGETATION: BELOWGROUND BIOMASS,
Marine Biological Lab., Woods Hold, MA. Boston Univ. Marine Program.
For primary bibliographic entry see Field 5C.
W79-01222

RESPONSE IN PRODUCTION OF CORD GRASS, SPARTINA ALTERNIFLORA, TO INORGANIC NITROGEN AND PHOSPHORUS FERTILIZER,
Delaware Univ., Newark. Dept. of Biological Sciences.
M. J. Sullivan, and F. C. Daiber.
Chesapeake Sci. 15(2), p 121-123, 1974.

Descriptors: *Cord grass, Fertilizers, Grasses, Inorganic nitrogen, Marshes, *Nitrogen, Nutrients, *Phosphorus, *Production, Spartina-alterniflora.

Fertilization of a low marsh area inhabited by S. alterniflora, with inorganic N and P compounds was conducted on a monthly basis during the 1972 growing season. Yield, as measured by an increase in fresh weight after harvest, was significantly higher in the N fertilized area than the P fertilized site or control area. No effect of P could be demonstrated. It was concluded that N supplies are limiting production of dwarf form S. alterniflora in the salt marsh under study. Introduction of additional sources of inorganic N into a marsh deficient in N would tend to increase its productivity.--Copyright 1974, Biological Abstracts, Inc.
W79-01225

AN ECOLOGICAL STUDY OF A BALDCYPRESS SWAMP IN ST. CHARLES PARISH, LOUISIANA,
Army Engineer District, New Orleans, LA.
G. N. Montz, and A. Cherubini.
Castanea, Vol. 38, No. 4, p 378-386, December, 1978. 3 fig, 2 tab, 18 ref.

Descriptors: *Swamps, *Succession, *Ecology, *Baldcypress, Wetlands, *Louisiana, Rooted aquatic plants, Standing waters, Reproduction.

A baldcypress (Taxodium distichum (L.) Richard) swamp bordering a marsh in St. Charles Parish was studied by the quadrat method. A dense undergrowth of alligatorweed (Alternanthera philoxeroides (Mart) Griseb.) covered most of the study area. Plant succession with extension of baldcypress into the marsh was studied by comparing township maps of 1860 and quadrangle maps of 1955 and 1957 to quadrangel maps of 1969. Only baldcypress was recorded, with treee diameters increasing from the marsh-swamp zone into the swamp. Of the 639 trees recorded in the study area, 357 were dead. (Stihler-Mass)
W79-01226

METALS FROM URBAN RUNOFF IN DATED SEDIMENTS OF A VERY SHALLOW ESTUARY,
California Univ., Irvine. School of Engineering.
For primary bibliographic entry see Field 5A.
W79-01251

HYDROCARBONS IN THE MARINE ENVIRONMENT OF PORT VALDEX, ALASKA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5B.
W79-01254

ANALYTIC SOLUTIONS FOR COMPUTER FLOW MODEL TESTING,
Thayer School of Engineering, Hanover, NH.
D. R. Lynch, and W. G. Gray.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY10, Proceedings Paper 14105, p 1409-1428, October 1978. 6 fig, 2 tab, 15 ref.

Descriptors: *Tidal effects, *Computer models, *Flow friction, *Waves(Water), *Bathymetry, Circulation, Fluid mechanics, Analytical techniques, Methodology, Equations, *Shallow water equations, Wind stress, Tidal forcing function.

A class of solutions of the linearized shallow water equations was presented. The solutions involve two spatial dimensions plus time. Special emphasis was placed on the dynamic steady-state. Wind stress, bathymetry which obeys a general power law, and two-dimensional circulation were included. The solutions give a broad spectrum of conditions against which model features can be tested. The availability of complete solutions for velocity, in addition to surface elevation, provides the means for verification of computed flow fields. The polar geometry solutions incorporate some boundaries which are not straight. Considerable economy can be realized by choosing a tidal forcing function that requires only one or two Fourier components in space. Various solutions presented are intended for use in testing and verification of numerical models. (Singh-ISWS)
W79-01256

THE DAM-BREAK WAVE AND THE BORE COLLAPSE ON A BEACH,
North Carolina State at Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W79-01263

THE ECOTONE BETWEEN SPARTINA FOLIOSA TRIN. AND SALICORNIA VIRGINICA L. IN SALT MARSHES OF NORTHERN SAN FRANCISCO BAY: III. SOIL AERATION AND TIDAL IMMERSION,
California Univ., Berkeley. Dept. of Botany.
B. E. Mahall, and R. B. Park.
Journal of Ecology, Vol. 64, No. 3, p 812-819, November, 1976. 1 tab, 4 fig, 31 ref.

Descriptors: *Salt marshes, *Marsh plants, *Distribution patterns, *Tidal effects, Wetlands, Tidal marshes, Ecological distribution, Oxygen, Tides, California, Halophytes, *San Francisco Bay.

Measurements of soil oxygen diffusion rates along the ecxotone between Spartina and Saicornia indicated slight decreases with increases with increasing depth, but there were no significant differences between readings taken in either zone. These results, together with the observation of iron oxides surrounding Salicornia roots in the marsh soil, indicate that soil aeration is not an important factor affecting distribution of Spartina and Salicornia about the mean high water econton. Experiments in which plants were exposed to artificial tides of different heights indicated that growth of Salicornia seedlings and older plants is reduced by 30-34% by tides only 8 cm higher than in the control and lasting only 1/12 of the daylight period. The higher tides also inhibited re-rooting and the production of new branches. Growth of Spartina plants was not significantly affected. This indicates that growth inhibition resulting from tidal immerdion may be an important factor checking the seaward advance of Salicornia and tending to exclude it from the Spartina zone. (See also W79-01217 and W79-01218) (Steiner-Mass)
W79-01283

HABITAT USE AND HOME RANGE OF MALLARDS BREEDING IN MINNESOTA,
Minnesota Univ., St. Paul. Dept. of Ecology and Behavioral Biology.
For primary bibliographic entry see Field 2I.
W79-01287

BIODEPOSITION BY SALT-MARSH INVERTEBRATES,
Georgia Univ., Sapelo Island. Marine Inst.
For primary bibliographic entry see Field 5B.
W79-01288

GROWTH AND MORTALITY OF LITTORINA IRRORATA SAY IN THREE NORTH CAROLINA MARSHES,
North Carolina Univ. at Chapel Hill. Dept. of Zoology.
A. E. Stiven, and J. T. Hunter.
Chesapeake Science, Vol 17, No 3, p 168-176, September, 1976. 3 fig, 5 tab, 22 ref.

Descriptors: *Snails, *Salt marshes, *North Carolina, *Growth rates, *Mortality, Wetlands, Marshes, Gastropods, Marsh plants, Environmental effects, Density, Size, Growth stages.

Growth and mortality of the salt marsh gastropod, Littorina irrorata, were examined for one year at three levels of population density within three salt marshes. The standing crop of the dominant vegetation, Spartina alterniflora, differed among the three marshes. Gastropod density was manipulated by enclosures. Overall weight gains differed among marshes, density treatments, and three size classes of snails. Weight gain in the smallest individuals was significantly different among the marsh areas, but not the density treatments. For intermediate-sized individuals, growth rate differences occurred only in response to the density treatments. In adults, weight gain was different in the three marshes., but the density treatments had little effect. Within-cage mortality appeared independent of the density treatments, but significantly different among the marshes. (Steiner-Mass)
W79-01289

NITRATE AND NITRITE IN THE SURFACE WATERS OF TWO DELAWARE SALT MARSHES,
Delaware Univ., Newark. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5B.
W79-01291

GROWTH AND RESOURCE ALLOCATION RESPONSES OF SPARTINA ALTERNIFLORA LOISEL TO THREE LEVELS OF NH SUB 4-N, FE, AND NACL IN SOLUTION CULTURE,
Georgia Univ., Athens. Dept. of Botany.
For primary bibliographic entry see Field 2I.
W79-01294

PRIMARY PRODUCTION OF EDAPHIC ALGAL COMMUNITIES IN A DELAWARE SALT MARSH,
Delaware Univ., Newark. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W79-01296

TRANSPLANTATION OF SALT MARSH VEGETATION. II. GEORGETOWN, SOUTH CAROLINA,
Saint John's Univ., Jamaica, NY. Dept. of Biology.
R. Stalter.
Castanea, Vol. 38, No. 2, p 132-139, June, 1973. 3 tab, 12 ref.

Descriptors: *Salt marshes, *Rooted aquatic plants, *Ecological distribution, *South Carolina, Coastal marshes, Wetlands, Marshes, Aquatic plants, *Transplantation, Ecology.

A salt marsh located on the Baruch plantation at Georgetown, South Carolina includes four vegetation zones: the Upper High Marsh, Lower Marsh, Upper Low marsh, and Lower Low Marsh. Thirty plants of each of the dominant vegetations in each zone were transplanted into the other three vegetation zones, and thirty plants of each of the dominant species in each zone were dug up ad replanted in the same zone to serve as controls. Survival and growth rate of the transplants suggest that several species can tolerate conditions not found in their usual zones for a period of a year or longer. Salicornia virginica of the Lower Highe Marsh can grow in the Upper Low Marsh for a period of a year while Spartina patens of the Upper High Marsh demosntrated a ten percent survival rate when moved to the Lower High Marsh after a period of two years. The data suggest that there are two forms of Spartina alterniflora, a dwarf occupying the Upper Low Marsh, anda tall occupying the Lower Low Marsh. (Stihler-Mass)
W79-01306

TRENDS IN THE ABUNDANCE OF AMERICAN SHAD, ALOSA SAPIDISSIMA, IN THE DELAWARE RIVER BASIN,
Texas A and M Univ., College Station. Dept. of Wildlife and Fisheries Sciences.
For primary bibliographic entry see Field 5C.
W79-01322

PHOSPHORUS CYCLING IN NUPHAR LUTEUM COMMUNITIES IN THE LOWER CHOWAN RIVER, NORTH CAROLINA,
East Carolina Univ., Greenville. Dept. of Biology.
For primary bibliographic entry see Field 5C.

W79-01326

FATTY ACID COMPOSITION OF ORGANIC DETRITUS FROM SPARTINA ALTERNIFLORA,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5C.
W79-01332

MIXING AND DISPERSION IN ESTUARIES,
California Univ., Berkeley. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W79-01338

DISTRIBUTION OF BLUEGREEN ALGAE IN A MISSISSIPPI GULF COAST SALT MARSH,
Mississippi State Univ., Mississippi State. Dept. of Botany.
For primary bibliographic entry see Field 5B.
W79-01356

SEASONAL GROWTH AND DECOMPOSITION OF VALLISNERIA AMERICANA IN THE PAMLICO RIVER ESTUARY,
East Carolina Univ., Greenville. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-01362

HYDROLOGIC IMPACT OF LAND DRAINAGE ON ESTUARIES,
Geological Survey, Raleigh, NC Water Resources Div.
For primary bibliographic entry see Field 4A.
W79-01385

TIDAL SAMPLER,
Depart of Energy, Wash., DC. (Assignee).
For primary bibliographic entry see Field 7B.
W79-01388

BREAKWATER,
British Petroleum Co. Ltd., Sunbury-on-Thames (England). (Assignee).
For primary bibliographic entry see Field 8A.
W79-01400

STANDING CROPS OF MARSH VEGETATION OF TWO TRIBUTARIES OF CHESAPEAKE BAY,
Maryland Univ., Solomons. Chesapeake Biological Lab.
D. A. Flemer, D. R. Heinle, C. W. Keefe, and D. H. Hamilton.
Estuaries, Vol. 1, No. 3, p 157-163, September 1978. 1 fig, 2 tab, 27 ref.

Descriptors: *Standing crops, *Estuaries, *Marsh plants, *Brackish water, *Nutrients, *Biomass, Salinity, Nitrogen, Seasonal, Productivity, *Chesapeake Bay, Marshes, Salt marshes, Coastal marshes, Plant populations, Aquatic populations.

A comparative study of the standing crop of marsh vegetation as made of the Patuxent River and Parker Creek, two tributaries of Chesapeake Bay. The biomass of marsh vegetation in the tidal freshwater and brackish regions of the Patuxent was relatively uniform with regard to salinity, seasonaly high concentrations of dissolved nitrogen, and phosphorus and nutrient gradient. Maximum values of biomass occurred in the tidal freshwater and slightly brackish water region of Parker Creek, a system whose nutrient concentrations approximated 20% ofthose of Patuxent River. Biomass values for the Patuxent River and Parker Creek averaged about 1417 and 895 grams per square meter dry weight, respectively, Estimates of total annual marsh production based on the maximum standing crop was 27 x 103 and 519 metric tons, respectively, for the Patuxent River and parker Creek. (EIS-Katz)
W79-01433

WATER QUALITY INVESTIGATION RELATED TO SEAFOOD PROCESSING WASTEWATER DISCHARGES AT DUTCH HARBOR, ALASKA, OCTOBER 1975, OCTOBER 1976,
Environmental Protection Agency, Anchorage, AL. Alaska Operations Office.
For primary bibliographic entry see Field 5C.
W79-01469

AN ALTERNATIVE PERSPECTIVE ON COMMON PROPERTY RESOURCE ALLOCATION DECISIONS IN THE COASTAL ZONE,
Texas A and M Univ., College Station. Dept. of Political Science.
For primary bibliographic entry see Field 6A.
W79-01494

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

SOLAR-ASSISTED STILL WITH VAPOR-COMPRESSION OPTION,
California Univ., Berkeley. Sea Water Conversion Lab.
B. W. Tleimat, E. D. Howe, and A. D. K. Laird.
Desalination, Vol. 22, p 41-54, 1977. 11 fig, 18 ref. (California Water Resources Center Desalination Project UCAL-S-106).

Descriptors: *Desalination, *Desalination apparatus, *Solar stills, *Vapor compression distillation, *Distillation, Evaporators.

A scheme is proposed where steam, generated from solar collectors, is used to drive a multiple-effect still with novel high performance rotating-disk wiped-film evaporators, thus resulting in an order of magnitude reduction of collector area. Mechanical energy to drive pumps and other accessories would be provided by a fuel-powered heat engine. During extended sunless periods, an engine drives a vapor compressor and keeps the plant operating at reduced capacity. Preliminary analysis indicate favorable economics for a medium capacity plant. (Snyder-Calif, Davis)
W79-01126

HIGH-TEMPERATURE SOLUBILITIES OF CALCIUM SULFATE HEMIHYDRATE AND ANHYDRITE IN NATURAL SEAWATER CONCENTRATES,
California Univ., Los Angeles. School of Engineering and Applied Science.
J. Glater, and J. Schwartz.
Journal of Chemical and Engineering Data, Vol. 21, No. 1, p 47-52, 1976. 6 fig, 4 tab, 18 ref. (California Water Resources Center Desalination Project S-113 and S-114).

Descriptors: Saline water, *Desalination, *Scaling, *Sea water, Solubility, *Calcium sulfate, Corrosion control.

Solubilities of high-temperature calcium sulfate modifications, hemihydrate and anhydrite, are measured in natural seawater at temperatures up to 165C. Scaling thresholds or concentration-temperature limits are determined over a temperature range of 91-162C. A new graphical method of scaling threshold evaluation is described. Experimental data are compared with literature values. Scaling thresholds calculated from the extended Debye-Huckel theory are in good agreement with the experimental results. A complete scaling threshold diagram for hemihydrate and anhydrite is also developed. Scaling threshold evaluation is important in the operation of desalting equipment, boilers, and cooling towers. (Snyder-Calif, Davis)
W79-01128

SPECIFICATION OF CELLULOSE ACETATE TO BE USED IN SEMIPERMEABLE MEMBRANES,
California Univ., Los Angeles. School of Engineering and Applied Science.
M. C. Chan, and J. W. McCutchan.
Desalination, Vol 17, p 353-366, 1975. 9 fig, 4 tab, 18 ref. (California Water Resources Center Desalination Project S-113 and S-114).

Descriptors: *Saline water, *Desalination, Salinity, *Membranes, Membrane processes, Cellulose acetate membranes, *Semipermeable membranes.

Compositions of casting solutions of cellulose acetate were optimized in order to investigate the performance of the resulting semipermeable membranes as a function of viscosity rating and acetyl content of the polymer. The results show that the effect of viscosity of the cellulose acetate on membrane performance is as important as the effect of acetyl content in the ranges tested. (Snyder-California)
W79-01129

POTENTIODYNAMIC STUDIES OF ANTIMONY IN ACIDIC AND ALKALINE SOLUTIONS,
California Univ., Los Angeles. School of Engineering and Applied Science.
For primary bibliographic entry see Field 8G.
W79-01232

POLARIZATION AND PHOTOPOTENTIALS OF INSB IN NAOH,
California Univ., Los Angeles. School of Engineering and Applied Science.
For primary bibliographic entry see Field 8G.
W79-01233

ELECTRODISSOLUTION OF NICKEL IN MOLTEN LICL-KC1,
California Univ., Los Angeles. School of Engineering and Applied Science.
For primary bibliographic entry see Field 8G.
W79-01234

HYDROGEN EVOLUTION AND CORROSION BEHAVIOR OF FE-NI ALLOYS IN H2SO4 - EFFECT OF TEMPERATURE, C1- AND BENZATRIAZOLE,
California Univ., Los Angeles. School of Engineering and Applied Science.
For primary bibliographic entry see Field 8G.
W79-01235

THE EFFECT OF HYDRAULIC JUMP ON THE PERFORMANCE OF A SINGLE-STAGE FLASH EVAPORATOR,
Toronto Univ. (Ontario). Dept. of Mechanical Engineering.
A. H. Abdelmessih, and I. C. Hsu.
Desalination, Vol. 19, p 65-74. 1976, 10 fig, 6 ref. (California Water Resources Center Desalination Project).

Descriptors: *Desalination, *Hydraulic jump, *Flash evaporation, *Evaporators, Desalination processes.

The interaction between the hydraulic jump and the rate of flash evaporation has been investigated experimentally. The results obtained show that as the interstage temperature potential is increased, a corresponding increase in the rate of flash evaporation is noted together with variation in the characteristics of the hydraulic jump. The results also show that the rate of flashing is independent of the mass flow rate in the flash evaporator if the hydraulic jump is not changed. The analysis of the experimental results, together with photographic pictures, clearly show that the hydraulic jump region has the dominating effect on the rate of flashing and therefore, cannot be neglected in the analysis of flash evaporators. (Snyder-Calif, Davis)
W79-01238

SOLAR-ASSISTED DISTILLATION OF SEA WATER,
California Univ., Berkeley. Sea Water Conversion Lab.
B. W. Tleimat, and E. D. Howe.
Heliotechnique and Development, Vol. 2, p 458-482. August 1976, M. A. Kettani and J. E. Sousson, Editors. Development Analysis Associates, Inc., Cambridge, Massachusetts. Proceedings of the COMPLES International Conference, Dhahran, Saudi Arabia, November 2-6, 1975. (California Water Resources Center Desalination Project).

Descriptors: *Solar distillation, *Desalination, *Desalination plants, Thin films, Energy, Water supply, Sea water, Evaporators.

A preliminary design of a plant to produce 40 m3/day of fresh water is given. The plant consists of a 15-effect rotating evaporator, together with the solar collector, water storage tanks, flash tank and various pumps and controls. Steam is condensed on the inside flat surfaces of narrow cylindrical enclosures, and latent heat is used to partially evaporate sea water from thin films on the other faces. The electrical energy required is of the order of 5 kWh/m3 of water produced. Cost estimates indicate that water could be produced more cheaply by the proposed plant than by basin-type distillers. (Snyder-Calif, Davis)
W79-01239

INVESTIGATION OF HEAT TRANSFER COEFFICIENTS OF WORKING FLUIDS IN GEOTHERMAL POWER CYCLES,
California Univ., Berkeley. Sea Water Conversion Lab.
For primary bibliographic entry see Field 4B.
W79-01279

CATION-EXCHANGE COLUMN BEHAVIOR IN A DESALINATION PROCESS WITH REGENERANT RECOVERY,
California Univ., Berkeley. Dept. of Chemical Engineering.
D. J. Vermeer, S. Lynn, and T. Vermeulen.
I&EC Process Design & Developmet, Vol. 14 P 90-297, July 1975. 17 fig, 4 tab, 5 ref. (California Water Resources Center Desalination Project S-113 and S-114).

Descriptors: *Desalination processes, *Brackish water, *Ion exchange, Chemical reactions, *Cation exchange.

Weak-base and strong-acid ion exchangers for desalting of brackish water can be regenerated with aquious ammonia and hydrochloric acid. A new processing technique would supply these chemicals by treating recycled ammonium chloride with magnesium oxide or hydrocxy chloride to release ammonia and subsequently calcining magnesium chloride at tempertures below 500C to produce a bse and hydrogen chloride. The net result is a process for deslting brackish water by ion exchange which requires and input only of thermal energy. Performance characteristics of the selected cation exchange, polystyrenesulfonic acid 12% cross-linked, are reported dith respect to brackish water feed at around 0.1 N regenerant HC1 at 5 N. Equilibira for the system H+-Na+-Ca2+ are given, along with data on resin shrinkage and Donnan uptake at 5f N, and are Attributed to nonideal behavior in both coexisting phases. In column runs measuring effluent-concentration history, failure to observe sharpening of breakthrough at lower flow rates during regeneration is attributed to 'fingering' flow caused by short-range reversal of the otherwise stable density gradient. Significace of the equilibrium and breakthrough data for process design is discussed. (Snyder-Calif, Davis)
W79-01280

ELECTROCHEMICAL BEHAVIOR OF ROTATING IRON DISKS EFFECT OF FE(111),
California Univ., Los Angeles. School of Engineering and Applied Science.
For primary bibliographic entry see Field 8G.
W79-01281

CYCLIC PERFORMANCE OF LAYERED BEDS FOR BINARY ION EXCHANGE,
California Univ., Berkeley. Dept. of Chemical Engineering.
G. Klein, and T. Vermeulen.
AIChE Symposium Series, Vol 71, No 152, p 69-76, 1975. 10 fig, 4 ref. (California Water Resources Center Project UCAL-WRC-S-172).

Descriptors: *Ion exchange, Chemical reactions, *Resins, Exchangers, *Layered beds, Performance.

Layered beds involve the sequential use of a resin favorable to regeneration and a resin favorable to exhaustion, operated cyclically, with the exhaustion and regeneration flows occurring in opposite directions. A local equilibrium analysis is provided, which gives ideal efficiencies through either graphical or numerical calculations. Also, the results of such calculations are presented in graphs which facilitate the selection of resins and of the proportions in which they should be used. (Snyder-Calif, Davis)
W79-01339

MIXED-BED ION EXCHANGE DESALTING BY THE CALCIUM HYDROXIDE PROCESS,
California Univ., Berkeley. Dept. of Chemical Engineering.
V. W. Page, G. Klein, F. M. Golden, and T. Vermeulen.
AIChE Symposium Series, Vol 71, No 132, p 121-127, 1975, 7 fig, 1 tab, 13 ref. (California Water Resources Center Project UCAL-WRC-S-172).

Descriptors: *Desalination processes, *Model studies, *Calcium hydroxide, *Ion exchange, Saline water.

A model theoretical study of a mixed-bed ion exchange system is described. A desalination step, consisting of a saline water feed to the mixed bed in the calcium and hydroxide forms, is followed by a two-step regeneration scheme which utilizes a slurry of calcium hydroxide in freshwater. The calcium hydroxide can then be filtered from the product and regenerant streams for reuse. Whether the desalination step produces more or less water than the regeneration scheme uses must be determined for process evaluation. (Snyder-Calif, Davis)
W79-01340

POLARIZATION AT MEMBRANE/SOLUTION INTERFACES,
California Univ., Berkeley. Sea Water Conversion Lab.
K. S. Spiegler, J. Leibovitz, and J. Sinkovic.
Proceedings, Study Week on Biological and Artificial Membranes and Desalination of Water, April 14-19, 1975. Elsevier Scientific Publishing Co., New York, 1976, p 1-20. S-113.

Descriptors: *Electrodialysis, *Reverse osmosis, Desalination processes, *Polarization, Membrane processes.

A summary and status report are presented of the study of interfacial polarization in electrodialysis at the Sea Water Conversion Laboratory, University of California - Berkeley. The processes studied in the membrane research group of this Laboratory are electrodialysis (in which ions and water are transported across membranes under the influence of electrical forces), and hyperfiltration (reverse osmosis) in which the driving force is pressure. The experimental results described were obtained under realistic conditions of solution flow (i.e. actual plant hydrodynamics), except experiments with laser interferometry, which were performed in a small, bench-scale cell. (Snyder-Calif, Davis)
W79-01342

THE ROLE OF MEMBRANE METHODS IN THE DESALINATION OF BRACKISH WATER,
California Univ., Berkeley. Sea Water Conversion Lab.
K. S. Spiegler.
Proceedings, International Symposium on Brackish Water as a Factor in Development, January 1975, Ben Gurion Univ. of the Negev, Beer-Sheva, p 221-230, 1977. 7 fig, 7 ref.

Descriptors: *Mass transfer, *Reverse osmosis, *Electrodialysis, *Desalination, *Brackish water, *Membrane processes.

Achieving the optimal production rate of membrane units for desalination depends critically on the reduction of mass-transfer bottlenecks, termed 'polarization,' at the membrane-solution interfaces. Research on polarization phenomena in hyperfiltration (reverse osmosis) and electrodialysis is reported. (Snyder-Calif, Davis)
W79-01343

INDUCED CRYSTALLIZATION OF LARGE FREE ICE CRYSTALS IN SLOWLY FLOWING BRINE,
Monsanto Research Corp., Dayton, OH.
E. F. Janzow, and B. T. Chao.
Desalination, Vol 12, 1973, p 163-175. 6 fig, 11 ref. OWRT S-007-ILL(i).

Descriptors: *Crystallization, *Desalination, Separation techniques, Ice-brine system, *Freezing processes, Brines, Ice crystals, Ice formation.

A new crystallization phenomenon of ice from brine is described. Within a relatively narrow range of subcooled brime temperatures, plate-like free ice crystals of up to several inches in length were formed in the bulk of slowly traversing brine simultaneously with the growth of dendritic ice on a cold surface. System conditions under which the phenomenon would occur were determined for brines contaning 1,700 to 30,000 ppm sodium chloride and traversing at 0.009 ft/sec. The salt concentration of melted samples of ice produced in this manner, with and without brine removal treatment is given.
W79-01429

3B. Water Yield Improvement

RANDOMIZED CLOUD SEEDING IN THE SAN JUAN MOUNTAINS, COLORADO,
Aerometric Research Inc., Goleta, CA.
R. D. Elliott, R. W. Shaffer, A. Court, and J. F. Hannaford.
Journal of Applied Meteorology, Vol. 17, No. 9, p 1298-1318, September 1978. 12 fig, 7 tab, 14 ref.

Descriptors: *Cloud seeding, *Weather modification, *Snowfall, *Colorado, *Colorado River Basin, Silver iodide, Precipitation(Atmospheric), Mountains, Model studies, Mathematical models, Networks, Precipitation gages, Runoff, Water resources, Snowpacks, Snowmelt, On-site investigations, Meteorology, *San Juan Mountains(Colo).

A five-year, randomized cloud seeding program conducted in the San Juan Mountains of southwestern Colorado by the Bureau of Reclamation was completed in April 1975. The test design included randomization of the seeding by 24 h experimental days, and other features such as operation only during suitable cloud and wind conditions, and suspension to avoid adverse effects on the public and environment. Previous experimentation near Climax, Colorado, during the 1960's had identified conditions under which clouds seeded with silver iodide would produce more snow than similar, untreated clouds. The purpose of the Colorado River Basin Pilot Project was to determine whether the experimental procedure applied at Climax would be effective in an operational mode. The objectives were twofold: (1) to test the physical concepts of weather modification potential, and (2) to test the practical weather modification potential for an operational technology in the continental weather systems that bring snow to the San Juans. A formal statistical analysis based on precipitation data for 71 experimental treated days and 76 experimental control days found no significant difference between precipitation, gage-by-gage, on seeded and unseeded days, even after deletion of 22 control days suspected of contamination by

previous seeding. An a posteriori analysis, based on 6 h time blocks (in place of the 24 h day called for in the experimental design), indicated that positive seeding effects may have been achieved during periods of warm cloud-top temperatures, as expected from the Climax experiment. These positive effects may have been overbalanced in the experiment by decreases in snowfall due to seeding unfavorable cloud types. The results of the a posteriori analysis suggested that an operational seeding program, flawlessly carried out with perfect forecasts and no periods of suspension, could increase 15 October-15 May precipitation by 10-12% in various portions of the drainage basin. The resulting average precipitation increase during the snow accumulation season, put into a hydrologic streamflow model developed as part of the evaluation, yields a potential increase in annual runoff of the San Juan River of 197,000,000 cu m. In the Rio Grande Basin, on the downwind side of the crest, the potential increase in annual runoff is 186,000,000 cu m. (Sims-ISWS)
W79-01035

HEAT AND THRUST REQUIREMENTS OF A THERMAL FOG DISPERSAL SYSTEM,
Air Force Geophysics Lab., Hanscom AFB, MA.
B. A. Kunkel.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A025 112, Price codes: A03 in paper copy, A01 in microfiche. Report AFCRL-TR-75-0472, September 5, 1975. 43 p, 13 fig, 10 tab, 8 ref.

Descriptors: *Weather modification, *Fog, *California, *On-site investigations, Equipment, Testing procedures, Testing, On-site tests, Winds, Weather, Airports, Heat, Meteorology, *Irvine(Calif), Fog modification, *Thermal fog dispersal.

Field tests were conducted with a subscale momentum/heat system to determine the optimum heat and thrust requirements and combustor positions for a full-scale thermal fog dispersal system. The site, located in Irvine, California, was laid out on a 1/6 scale. The Froude number scaling law was used to scale up to full-scale. An array of 65 thermistors and 6 wind sensors were located in the target area over a simulated runway. Wind and temperature sensors also were located outside of the target area to prodvide background measurements during the tests. Tests were conducted at night, in clear air, during calm conditions. Both momentum ad passive heat systems were evaluated in terms of heat and thrust requirements for different wind conditions. A single line momentum/heat system requires 5 to 10 times as much thrust as does a two-side-of-the-runway system. A passive system requires anywhere from 130-470% more heat output than does a momentum system. The appropriate system for a particular airfield can be determined only after a cost analysis has been made of the various systems and a wind study has been made of the particular airfield. (Sims-ISWS)
W79-01058

A SOCIETAL ASSESSMENT OF THE PROPOSED SIERRA SNOWPACK AUGMENTATION PROJECT,
Human Ecology Research Services, Inc., Boulder, CO.
B. C. Farhar, and R. Rinkle.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 246, Price codes: A08 in paper copy, A01 in microfiche. Final Report, December 1976. 158 p, 1 fig, 84 tab, 44 ref, 1 append. Bur. Rec. 6-07-DR-20090.

Descriptors: *Weather modification, *Snowfall, *Social impact, *Surveys, *California, Social aspects, Snow, Water resources, Water resources development, Cloud seeding, Effects, Meteorology, *Sierra Mountains(Calif).

This report presented a descriptive analysis of the societal response to a proposed snowpack augmentation pilot project in California. A citizen survey (N = 200) obtained data on opinions about cloud seeding in comparison to other water-augmenting technologies, knowledge of and general attitudes toward weather modification, belief in the technology's effectiveness, and preferred decision-making methods. A related community-level study focused on factors hypothesized to be associated with a community's wilingness to experience a cloud seeding project. Data were presented on such variables as weather-related activities of the area, heterogeneity of weather needs, economic well-being, perception of water needs, history of public response to weather modification in the area, media position, compensatory arrangements, and preferred decision-making procedures. The conclusion reached was that the proposed project likely would find social acceptance, especially if certain identified problem areas could be resolved; and recommendations concerning these problems were offered. (Sims-ISWS)
W79-01063

AN ENERGY BUDGET ANALYSIS OF EVAPOTRANSPIRATION FROM SALTCEDAR,
Arizona Univ., Tucson. School of Renewable Natural Resources.
L. W. Gay, T. W. Sammis, and J. Ben-Asher.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol. 6, Proceedings of 1976 meetings American Water Resources Assn. and Arizona Acadamy of Science April 29- May 1, 1976, Tucson, Arizona, p. 181-187 (1976) (California Water Resources Center Project. OWRT C-6030(No. 5735)(1).

Descriptors: *Evapotranspiration, *Energy budget(Tamarisk), *Tamarisk, *Phreatophytes, Semiarid climates, *Rio Grande River(N Mex), *New Mexico, Lysimeters, Energy loss, Semi-arid lands.

Energy budget evaluations of evapotranspiration from saltcedar were carried out on the flood plain of the Rio Grade River, near Bernardo, New Mexico. The site was adjacent to the Bureau of Reclamation's lysimeter study of water use by saltcedar. The energy budget for the cloudless day of June 14,1975, revealed that energy gains from net radiation totaled 432 cal/cm2, while energy losses (in cal/cm2), were 14 to stored energy, 31 to convection, and 387 to evapotranspiration (ET). The energy loss to ET is equivalent to the latent energy contained in about 6.5 mm of water. The energy budget values are reasononable for a phreatophyte community in 2 a semi-arid environment. The latent energy loss compares favorably with 401 cal/cm2 measured by three lysimeters, although there were discrepancies in timing and amounts of loss among the individual lysimeters. The mean canopy diffusion resistance was 1.90 sec/cm over a 10-hour daytime period on June 14. The mean resistance was combined with vapor pressure deficit to predict lysimeter ET on three subsequent days. The agreement was within 12 percent, which suggests that diffusion resistance may be useful for simple ET predictions. (Snyder - Calif, Davis).
W79-01231

3C. Use Of Water Of Impaired Quality

SCALING AND CORROSION IN AN EXPERIMENTAL GEOTHERMAL POWER PLANTS,
San Diego Gas and Electric Co., CA.
H. K. Bishop, and J. R. Bricarello.
Journal of Petroleum Technology, Vol. 30, p 1240-1242, September, 1978. 1 fig, 1 tab, 10 ref.

Descriptors: *Thermal powerplants, *Geothermal studies, *Scaling, *Corrosion, Brines, Steam.

The San Diego Gas and Electric Co./U.S.D.O.E. Geothermal Loop Experiment Facility (GLEF) near Niland, Caifornia uses a high salinity geothermal fluid in a four-stage binary system with a turbine generator. This facility will become a 10 Mw power plant. The GLEF operates in three modes: (1) cascade mode, where condensed steam from the preceding stage is added to the next stage; (2) condensate reinjection mode, when the condensate from all stages is collected and injected in the last stage; and (3) the non-injection mode, where no condensed geothermal steam is injected, but instead is used as cooling water. Scale is deposited on pipe and vessel surfaces and the brine is cooled during the heat extraction process. Scale composition will vary from a lead-iron-silica mixture in the initial stage to s silica gel in the final stage. Recombining condensed steam with brine causes deposition of calcite scale due to the higher pH of the steam. Scale was removed using as acid-based softening solution followed by high pressure water. Only light to moderate corrosion was seen on mild steel vessels and lines contacting the geothermal brine due to the reducing nature of the brine and the protective effect in the scale. (Purdin-NWWA)
W79-01106

A NONSTRUCTURAL APPROACH TO CONTROL SALT ACCUMULATION IN GROUND WATER,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W79-01132

CORN AND ALFALFA PRODUCTION AS INFLUENCED BY IRRIGATION AND SALINITY,
Utah State Univ., Logan. Dept. of Soil Science and Biometeorology.
R. J. Hanks, T. E. Sullivan, and V. E. Hunsaker.
Soil Science Society of America Journal, Vol. 41, No. 3, p 606-610, May-June 1977. 5 fig, 6 tab, 9 ref. OWRT B-121-UTAH(1) and C-5189(No. 4233)(1), 14-31-0001-5120.

Descriptors: Osmotic pressure, Evapotranspiration, Soil water depletion, *Salinity, Irrigation water, *Corn(Field), *Alfalfa, Utah, Salt tolerance, *Water stress, Salt build-up, Crop production.

Yields of corn and alfalfa were determined where both salinity and water stress were imposed. Yields of corn (Zea mays L.) at Logan, Utah, in 1975 were decreased by salinity or water stress (caused by low irrigation levels) in direct relation to the decrease in evapotranspiration. The decrease in evapotranspiration was caused by a decrease in soil water depletion, indicating that salinity influenced soil water availability. Corn yields at Vernal, Utah, in 1974 were decreased by salinity, but to a considerably lesser extent by low irrigation, probably because of water flow upward into the root zone from a water table. Alfalfa (Medicago sativa L.) yields at Vernal in 1974 were not decreased by salinity or by low irrigation rates, because of water supplied by a water table and used by roots below the zone of salinity.
W79-01136

SALT PICKUP BY OVERLAND FLOW IN THE PRICE RIVER BASIN, UTAH,
Colorado State Univ., Fort Collins. Dept. of Earth Resources.
For primary bibliographic entry see Field 5B.
W79-01245

WATER QUALITY AND CONTROL OF PLANT PATHOGENS IN IRRIGATION REUSE,
Nebraska Univ., Lincoln. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W79-01358

3D. Conservation In Domestic and Municipal Use

URBAN RUNOFF POLLUTION AND WATER QUALITY PLANNING,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 5B.
W79-01134

WATER QUALITY: PROBLEMS AND RESEARCH NEEDS,

Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 6B.
W79-01348

CHEMICAL QUALITY OF WATER USED FOR MUNICIPAL SUPPLY IN FLORIDA, 1975,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01375

3E. Conservation In Industry

WASTEWATER PROBLEMS IN THE FOOD PROCESSING INDUSTRY IN THE LIGHT OF MODERN WATER MANAGEMENT (AZ ELELMISZERIPAR SZENNYVIZ-PROBLEMAI A KORSZERU VIZGAZDALKODAS TUKREBEN),
For primary bibliographic entry see Field 5D.
W79-01071

WASTEWATER TREATMENT IN THE SUGAR INDUSTRY (II) (ABWASSERAUFBEREITUNG DER ZUCKERWARENINDUSTRIE (II)).
For primary bibliographic entry see Field 5D.
W79-01072

ADDITION OF POTATO PROTEIN RECOVERED FROM POTATO STARCH FACTORY WASTE EFFLUENTS FOR BREAD,
For primary bibliographic entry see Field 5E.
W79-01073

PREPARATION OF COPPER PRECIPITATE FOR ELECTROLYTIC COPPER RECOVERY FROM ELECTROPLATING INDUSTRY WASTEWATER (DENKI MEKKI KOJO HAISUI KARA NO DO NO DENKAI KAISHU O MOKTEKI TO SHITA DO CHINDEN NO SEISEI HOHO),
For primary bibliographic entry see Field 5D.
W79-01076

ENERGY AND THE COLORADO RIVER,
Utah State Univ., Logan. Dept. of Economics.
J. C. Anderson, and J. E. Keith.
Natural Resources Journal, Vol 17, No 2, p 157-67, April, 1977.

Descriptors: *Comprehensive planning, *Energy, *Colorado River Basin, *Regional development, Water conservation, Water allocation(Policy), Competing uses, Economics, Water demand, Preferences(Water rights), Regional analysis, Water consumption.

There are four components to the argument that water will restrict development of energy resources in the Colorado River Basin: (1) the required maintenance of streamflow in local reaches of the river; (2) the required maintenance of water quality in local reaches; (3) shortage of water in the whole river system; and (4) water quality problems in the lower Colorado River. Considerable effort must be spent to develop a project, both in determining the physical and economic feasibility of new water uses, and in examining the legal institutional framework of governmental entities in the Basin. The concept of beneficial use is fundamental in the West, and certain appropriation rights and preferences in use have developed. These provisions impose problems to energy developers because of general low preference in the water rights law and provisions requiring early application to achieve beneficial use. The long-range committments necessary to most energy projects are troublesome to state water officers. Economic considerations are also important. The increased cost of water would create a strong impetus to transfer water from agriculture to other uses. Additionally, greater upstream diversions would increase the salt load, and impose greater damages downstream. (Rule-Florida)
W79-01167

ANALYSIS OF ECONOMIC EFFECT OF ENVIRONMENTAL REGULATIONS ON INTEGRATED IRON AND STEEL INDUSTRY. VOLUME II,
Temple, Barker and Sloane Inc., Wellesley Hills, MA.
For primary bibliographic entry see Field 5G.
W79-01194

LEGAL AND INSTITUTIONAL PLANNING FOR MACRO-CONSERVATION MEASURES,
Denver Univ., CO. Coll. of Law.
For primary bibliographic entry see Field 6E.
W79-01227

ENERGY CONSERVATION: IS THE HEAT STORAGE WELL THE KEY.,
General Electric Co., Santa Barbara, CA.
For primary bibliographic entry see Field 4B.
W79-01228

HEAT STORAGE WELLS CONSERVE FUELS,
General Electric Co., Santa Barbara, CA.
For primary bibliographic entry see Field 4B.
W79-01230

RECOVERY AND REUSE OF PAINT SOLIDS FROM WASTE WATER,
Drew Chemical Corp., Booton, NJ. (Assignee).
For primary bibliographic entry see Field 5D.
W79-01391

PROCESS FOR THE PURIFICATION OF INDUSTRIAL EFFLUENTS,
Ciba-Geigy Corp., Ardsley, NY. (Assignee).
For primary bibliographic entry see Field 5D.
W79-01396

METHOD FOR REMOVING OF MULTIVALENT HEAVY METALS FROM METAL PLATING WASTE EFFLUENTS,
Purdue Research Foundation, Lafayette, IN. (Assignee).
For primary bibliographic entry see Field 5D.
W79-01415

CONFERENCE PROCEEDINGS - A CRITICAL ECONOMIC BALANCE, WATER - LAND - ENERGY - PEOPLE - HELD AT COLORADO STATE UNIVERSITY, PINGREE PARK CAMPUS ON JUNE 6-7, 1977,
Denver Federal Executive Board, CO.
For primary bibliographic entry see Field 6B.
W79-01478

WATER -- DEMAND AND SUPPLY: ECONOMIC IMPACTS,
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
For primary bibliographic entry see Field 6B.
W79-01482

COAL DEVELOPMENT AND RECLAMATION - PLANNING AND CONSERVATION,
Grace (W. R.) and Co., Dallas, TX. Mining Div.
For primary bibliographic entry see Field 6B.
W79-01489

CRITIQUE AND CHALLENGES,
Energy Research and Development Administration, San Francisco, CA. Consumer Affairs. CA.
For primary bibliographic entry see Field 6B.
W79-01490

RESOURCE EXTRACTION AND RECYCLING WITH ENVIRONMENTAL COSTS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Economics.
For primary bibliographic entry see Field 6A.
W79-01492

MARKET INPUT/OUTPUT STUDIES. TASK I. VINYLIDENE CHLORIDE,
Auerbach Associates, Inc., Philadelphia, PA.
For primary bibliographic entry see Field 6B.
W79-01500

3F. Conservation In Agriculture

THE EFFECT OF DIRUNAL VARIATION IN LIGHT AND TEMPERATURE ON THE ACETYLENE REDUCTION ACTIVITY (N2 FIXATION) OF SUBTERRANEAN CLOVER,
California Univ., Davis Dept. of Agronomy and Range Science.
For primary bibliographic entry see Field 2I.
W79-01092

RELATION OF WATER ABSORPTION TO DURATION OF APPLICATION IN FURROW IRRIGATION,
Mississippi State Univ., Mississippi State. Dept. of Agricultural and Biological Engineering.
J. C. McWhorter.
Available from the National Technical Information Service, Springfield, VA 22161, as PB-288 654, Price codes: A03 in paper copy, A01 in microfiche. Mississippi Water Resources Research Institute Report, October 1978. 30 p 9 fig 7 tab, 5 ref. OWRT-A-113-MISS(1), 14-34-0001-8026.

Descriptors: *Soils, Soil moisture, *Application rates, *Absorption, *Soil water movement, Duration of application, Wetted cross section.

This study sought to relate the rate of absorption and depth of penetration of water for several durations of application and soil types with a constant head supply. The study utilized moveable, metal panels that were formed into a bottomless container 1.25 ft deep, 1 ft wide, and 50 ft long and filled with dry soil by a standard method. The soils were Marietta fine sandy loam and Ruston sandy loam. A V-shaped channel 9 inches wide and 2 inches deep was formed to 0.002 slope. Initial soil moisture condition was determined at 4.5 ft intervals. A constant flow rate was admitted to the channel. The rate of advance was monitored and the flow terminated at a predetermined time interval. Soil moisture and bulk density were determined. The wetted cross section of the soil at each station was observed and measured. Both soils had high absorptive rates. Depth of penetration and width of the wetted cross section increased with duration of flow. Upstream from the point of advance of water in the channel at the time of cessation of channel inflow, there was very little variation in the visible wetted cross section and the amount of soil moisture; however, downstream from this point, there was a rapid decrease in moisture. The results are depicted in graphs and tables.
W79-01094

CORN AND ALFALFA PRODUCTION AS INFLUENCED BY IRRIGATION AND SALINITY,
Utah State Univ., Logan. Dept. of Soil Science and Biometeorology.
For primary bibliographic entry see Field 3C.
W79-01136

DRAINAGE CONTROL TO DIMINISH NITRATE LOSS FROM AGRICULTURAL FIELDS,
North Carolina State Univ. at Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 5G.
W79-01137

FIELD STUDY OF SOLUTE MOVEMENT IN A HIGHLY AGGREGATED OXISOL WITH INTERMITTENT FLOODING: I. NITRATE,
Hawaii Univ., Honolulu. Dept. of Agronomy and Soil Science.
V. Balasubramanian, Y. Kanehiro, P. S. C. Rao, and R. E. Green.
J Environ Qual. 2(3), p 359-362, 1973.

Descriptors: *Aggregated oxisol, Ananas-comosus, *Fertilizers, *Flooding(Intermittent), Irrigation, *Nitrates, Oxisol, Saccharum-officinarum, Solutes, Water pollution, Hawaii.

Movement of applied nitrate (a concentrated solution sprayed uniformly over the soil surface) under intermittent flooding was investigated in Molokai silty clay (Typic Torrox), an important soil for sugarcane (Saccharum officinarum L.) and pineapple (Ananas comosus) production in Hawaii. Nitrate distribution in the profile was characterized under an extended irrigation scheme by in situ sampling of soil solutions with suction probes 1 wk after each water application. The nitrate peak moved only 1/3 as far as would have been predicted by a piston displacement model. Equilibration of applied nitrate solution with the aggregated surface soil for beta wk prior to flood irrigation further retarded nitrate leaching. Apparently, equilibration involved bulk flow and diffusion of nitrate into aggregate micropores where the solute was less susceptible to transport in water being conducted mostly in the macropores during and soon after irrigation. Prediction of nitrate distribution based on dispersion (diffusion plus convection) equation approximated experimental results for successive irrigations reasonably well when equation parameters were obtained by fitting one set of experimental data. The drawback of this theoretical model is discussed.--Copyright 1974, Biological Abstracts, Inc.
W79-01360

WATER CONDUIT,
G. Gilead.
U.S. Patent No. 4,095,750, 4 op, 5 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 971, No 3, p 1022, June 20, 1978.

Descriptors: *Patents, *Irrigation, *Irrigation practices, *Irrigation efficiency, Application equipment, Conduits, Pipes, Drip irrigation.

A water conduit of flexible material serves as an irrigation device or as a drainage pipe. At regular or irregular distance from one another cuts are made in the wall of the conduit resulting in tongue like portions which adhere to the wall of the conduit along an uncut portion. These tongues are movable out of the plane of the wall and have an outer surface which is smaller in area than the inner surface. If used as an irrigation device, the hose or conduit is connected to a supply of water which flows under a certain pressure. Under the pressure the tongues will be pressed upwardly making the conduit tight around its circumference, except at the nick through which water can trickle or drip. The tongues can be of any configuration but in all cases the tongues adhere to the wall of the hose by an uncut web. (Sinha-OEIS)
W79-01390

GUIDANCE CONTROL SYSTEM FOR SELF-PROPELLED MOBILE SPRINKLER IRRIGATION SYSTEMS,
D. A. Cortopassi.
U.S. Patent No. 4,099,669, 6 p, 5 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 972, No 2, p 589, July 11, 1978.

Descriptors: *Patents, *Irrigation, *Irrigation systems, Irrigation efficiency, Control systems, Application equipment, Sensors, Laser projection, Laser sensors, Self-propulsion.

A mobile sprinkler irrigation system comprises an elongate sprinkler supply pipe supported at one end by a self-propelled pace carriage and along the length by a number of spaced self-propelled follower carriages. A tower on the pace carriage supports a laser projection system that projects a laser plane parallel to and along the length of the sprinkler supply pipe. The follower carriages carry laser sensor units placed to intercept the laser plane whenever a follower carriage falls out of alignment with the pace carriage. Control circuitry operates in response to the sensors to control the propulsion wheels for the follower carriages so that the carriages follow the laser plane. Thus, the follower carriages follow the path of the laser plane, as defined by the pace carriage, whether the path be curvilinear, or rectilinear. (Sinha-OEIS)
W79-01410

ADJUSTABLE HEIGHT SPRINKLER,
J. C. Cole, and E. W. Morain.
U.S. Patent No. 4,099,670, 6 p, 5 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 972, No 2, p 589, July 11, 1978.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Application equipment, Irrigation practices, Irrigation efficiency.

An adjustable height sprinkler apparatus has three tubular portions telescopically received within each other. The base portion is buried vertically in the ground and connected to a source of water at the lower end, the upper end being adjacent the earth's surface. A second tubular extension member is telescopically positioned within the tubular base portion. A third tubular pop-up member is telescopically positioned in the extension number. It will slide downward by gravity and will be pushed up when water pressure is applied to the sprinkler. The pop-up member has an enlarged diameter portion at the upper end with means for attaching a sprinkler head. The object of the invention is to provide an adjustable height sprinkler including a pop-up feature so that the sprinkler may be completely hidden when not in use. (Sinha-OEIS)
W79-01411

IRRIGATING CORN AND GRAIN SORGHUM WITH LIMITED WATER,
Kansas State Univ., Manhatten.
L. R. Stone, R. E. Gwin, Jr., and M. A. Dillon.
Kansas Agricultural Experiment Station Bulletin, Keeping Up With Research No. 17, March 1975, 4 p, 1 fig, 3 tab, Kansas Water Resources Research Institute Contribution Number 160. OWRT A-069-KAN(1), 14-31-0001-5016.

Descriptors: Growth stage, Grain sorghum, Irrigation water, *Irrigation timing, *Limited irrigation, Corn(Field).

In 1974 an evaluation was made of how irrigation amount and timing influenced corn and grain sorghum yields at Manhatten and Tribune, Kansas. The resuls should help irrigators who want to use limited or less water because of limited pumping capacity, limited time, limited water supplies, increased cost of fuel for pumping, or other reasons. The corn data indicate that a single irrigation applied near tasseling or at early skilled increased yields greatly over one irrigation at blister stage or no in-season irrigation. Due to grain sorghum's drought resistance, and timely rainfall, no definite trend between irrigation timing and grain sorghum yield was determined in 1974. Limited in-season irrigation is most practical in soils that contain nothing to restrict extensive root development and that have large water-holding capacity, and if a moderate to large amount of available water is stored before planting.
W79-01425

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

REGIONAL WATER SUPPLY CAPACITY EXPANSION WITH SEASONAL DEMANDS AND ENERGY COSTS,
California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 6A.
W79-01002

COLORADO BIG THOMPSON FLOOD: GEOLOGIC EVIDENCE OF A RARE HYDROLOGIC EVENT,
Denver Univ., CO. Dept. of Geography.
For primary bibliographic entry see Field 2E.
W79-01047

INTERCOMPARISON OF CONCEPTUAL MODELS USED IN OPERATIONAL HYDROLOGICAL FORECASTING.
World Meteorological Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 2A.
W79-01062

DRAINAGE CONTROL TO DIMINISH NITRATE LOSS FROM AGRICULTURAL FIELDS,
North Carolina State Univ. at Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 5G.
W79-01137

RIPARIAN RIGHTS UNDER THE TEXAS WATER RIGHTS ADJUDICATION ACT - A CONSTITUTION ANALYSIS,
For primary bibliographic entry see Field 6E.
W79-01140

VESTED RIGHTS TO DEVELOP LAND: CALIFORNIA'S AVCO DECISION AND LEGISLATIVE RESPONSES,
For primary bibliographic entry see Field 6F.
W79-01148

THE TENNESSEE VALLEY AUTHORITY'S TELLICO DAM PROJECT-COSTS, ALTERNATIVES, AND BENEFITS.
General Accounting Office, Washington, DC.
For primary bibliographic entry see Field 6B.
W79-01193

FRESH-WATER WEEDS ARE A RESOURCE,
Rothamstead Experimental Station, Harpenden, (England).
For primary bibliographic entry see Field 5C.
W79-01197

AQUATIC WEED MANAGEMENT: SOME PROSPECTS FOR THE SUDAN AND THE NILE BASIN, REPORT OF A WORKSHOP HELD AT KHARTOUM, SUDAN ON 24-29 NOVEMBER 1975.
Agricultural Research Council, Khartoum (Sudan).
For primary bibliographic entry see Field 5G.
W79-01205

ESTIMATION OF WATER BALANCE OF LOWER SUTLEJ CATCHMENT UP TO BHAKRA DAM SITE BY THORNTHWAITE'S METHOD,
Meteorological Office, New Delhi (India).
K. K. Srivastava, S. D. S. Abbi, and B. R. Loe.
Indian Journal of Meteorology, Hydrology and Geophysics, Vol. 28, No. 4, p 507-514, October 1977. 8 fig, 3 tab, 4 ref.

Descriptors: *Runoff forecasting, *Water balance, *Watersheds(Basins), Runoff, Dams, Soil moisture, Estimating, Meteorological data, Moisture deficit, Irrigation, Monsoons, Foreign countries, Foreign research, *India, *Sutlej Catchment(India), *Bhakra Dam(India), *Thornthwaite method.

An estimate was presented of the water balance by the Thornthwaite method for the lower Sutlej catchment between Rampur and the Bhakra Dam site. Maps showing the monthly water deficit, water surplus, soil moisture utilization, and soil moisture recharge for the period 1964-68 were prepared. Annual runoff in the Sutlej River was estimated on the basis of the water balance parameters for the same period. A year-to-year analysis

of the data showed that March to June is the period when the basin falls short of the potential water needs for crops and vegetation. The post-monsoon period, October and November, also is prone to water deficit. To some extent, January and February also are months of short water supply, except in years when appreciable amounts of precipitation occur in the basin during December, January, and February. The monsoon months of July, August, and September have sufficient water surplus for storage and runoff. The maximum water deficit occurs in May. (Roberts-ISWS)
W79-01257

PROCEEDINGS OF DAM-BREAK FLOOD ROUTING MODEL WORKSHOP.
Water Resources Council, Washington, DC. Task Force on Dam-Break Flood Routing.
For primary bibliographic entry see Field 8B.
W79-01262

SIMPLIFIED ROUTING THROUGH RESERVOIR,
Federal Energy Regulatory Commission, Washington, DC.
D. S. Tarnay.
In: Proceedings of Dam-Break Flood Routing Model Workshop; Workshop held October 18-20, 1977, Bethesda, Maryland: Hydrology Committee, United States Water Resources Council, Washington, D.C., p 65-74, October 1977.

Descriptors: *Flood routing, *Reservoirs, *Hydrograph analysis, *Approximation method, Analytical techniques, Theoretical analysis, Analysis, Hydrographs, Methodology, Floods.

In working with extreme floods, the designer of a new dam, or the engineer checking the stability and safety of an existing one, probably would welcome a simplified flood routing model. The model may help to determine quickly the routed peak of an extreme or design flood in order to see if the routed flood can or cannot be a significant factor in reducing the peak flood. The simplified routing method is a hydrologic routing of a non-uniform, unsteady flow, and may be used only for preliminary determination of the outflow peak. It cannot replace the more accurate routing models. The simplified routing procedure, when possible, is based upon approximating the recorded inflow hydrograph by a triangle or trapezoid and having a reservoir elevation-storage curve. The approximated inflow hydrograph permits the normal routing procedures to be reduced to an algebraic equations. The simplified method of routing can be adapted best if the volume of the available pondage or surcharge ad the volume of flood have a ratio between 0.25-0.75. (See also W79-01262) (Humphreys-ISWS)
W79-01266

THE DEVELOPMENT AND TESTING OF A DAM-BREAK FLOOD FORECASTING MODEL,
National Weather Service, Silver Spring, MD. Hydrologic Research Lab.
For primary bibliographic entry see Field 8B.
W79-01270

CALCULATING AND ROUTING THE TETON DAM-BREAK FLOOD,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8B.
W79-01271

QUALITATIVE COMPARISON OF THREE DAM BREAK ROUTING MODELS,
Sutron Corp., Arlington, VA.
For primary bibliographic entry see Field 8B.
W79-01273

DAM-BREAK FLOOD WAVE COMPUTATION BY METHOD OF CHARACTERISTICS AND LINEARIZED IMPLICIT SCHEMES,
Geological Survey, NSTL Station, MS. Gulf Coast Hydroscience Center.
For primary bibliographic entry see Field 8B.
W79-01274

DAM BREAK FLOOD WAVE ANALYSIS: PROBLEMS, PITFALLS, AND PARTIAL SOLUTIONS,
Hydrocomp, Inc., Palo Alto, CA.
For primary bibliographic entry see Field 8B.
W79-01276

SIMULATION OF DAM BREAK FLOODING UNDER NORMAL AND PROBABLE MAXIMUM FLOOD CONDITIONS,
Tippett-Abbett-McCarthy-Stratton, New York.
For primary bibliographic entry see Field 8B.
W79-01277

CRITERIA FOR ROUTING THE DAM-BREAK FLOOD,
Pacific Gas and Electric Co., San Francisco, CA.
For primary bibliographic entry see Field 8B.
W79-01278

INLAND WETLAND DEFINITIONS,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 6E.
W79-01335

EFFECT OF FAILURE OF THE OLD RIVER CONTROL STRUCTURE ON MUNICIPAL AND INDUSTRIAL WATER SUPPLIES,
Louisiana State Univ., Baton Rouge. Dept. of Civil Engineering.
H. J. Redmond.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 921, Price codes: A05 in paper copy, A01 in microfiche. M.S. Thesis, May 1977. 78 p, 6 fig, 8 tab, 27 ref, 3 append. OWRT A-040-LA(1), 14-34-0001-7040.

Descriptors: Risks, Disasters Dam Failure, Disaster planning, Flood control, Navigation, Water supply, Diversion, Water quality, *Louisiana, *Mississippi River, *Atchafalaya Basin Floodway, *Old River Control Structure.

The Old River Control Structure (ORCS) controls diversion of water from the Mississippi River to the Atchafalaya Basin. If diversion were uncontrolled, the Atchafalaya would probably capture the greater portion of the Mississippi's flow. Reduced flow in the Lower Mississippi River would adversely affect water quality in the Mississippi River below Old River in that the water adversely affect water quality in the Mississippi River below Old River in that the water in the channel would be increasingly affected by intrusion of salt water from the Gulf during low-flow periods. Presently (1977) the Lower Mississippi River provides 65% of the water pumped for industrial and thermoelectric uses in Louisiana and almost one-half the water used for public supply. About 6.8 billion gallons per day were withdrawn from the Mississippi River below Old River in 1975. Ground water and streams other than the Mississippi are potential supplemental or replacement fresh water sources. Total potential ground water yield in southeastern Louisiana is estimated at 1300 MGD. The Pearl River is a possible alternate source of Mississippi River water users on the left descending river bank from St. Charles Parish downstream. An estimated minimum 270 MDG of fresh water would be required by industries, power plants and for municipal supply in this area to replace the present supply. Pearl River stream flow data indicate 270 MGD could be supplied without reducing the river's minimum flow 92% of the time. Water from the Pearl could replace ground water by recharging the aquifers when Pearl River flows exceed that required to provide the 270 MGD requirement. A crude cost analysis indicates 270 MGD of water could be delivered to water users at a cost of approximately $.22/1000 gallons.
W79-01336

ANALYSIS OF WATER FLOW PROBLEMS IN THE HELLS CANYON OF THE SNAKE RIVER,
Idaho Univ., Moscow. Dept. of Civil Engineering.
J. H. Coffin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 944, Price codes: A09 in paper copy, A01 in microfiche. MS Thesis, June 1977. 166 p, 17 fig, 12 tab, 63 ref, 2 append. OWRT B-037-IDA(3).

Descriptors: *Idaho, *Snake River(Ida), *Hells Canyon, *Multiple-purpose reservoirs, *Dams, *Water utilization, *Hydroelectric power, *Model studies, Competing uses, Flow control, Water storage, Recreation, Project feasibility, Surveys, Water resources development, Mathematical models, Reservoirs, Project planning, Water demand, Irrigation, Human population.

The problems associated with water flow and operation of dams in the Hells Canyon area of the Snake River in Idaho were surveyed and possible solutions were examined. Conflicts between Idaho Power Company projects and plans for the Hells Canyon Recreation Area were reviewed with respect to timing and quantity of water needs. Also, population growth and irrigation development were assessed as future complicating factors. In view of agricultural and recreational uses increasing and the inflexibility of the Idaho Power Company's demands, some water shortages in the future are indicated. An analysis was performed on the possibility of building a reregulating dam below Hells Canyon dam; however, although physically feasible, such a dam has little political or social support and little chance of success. Finally, a simplified model was constructed to operate Brownlee storage reservoir and compute the electric energy that would be generated under various conditions. For example, it was determined that a drop of 23% in energy production was possible if streamflows dropped to the predicted level and if the 5000 cfs minimum release was maintained. Raising the minimum flow requirement had only a slight effect on total energy production. Suggestions for future studies include: the effect on total peaking production of varying parameters such as flow, inflow level, and rule curve level; inclusion in the computer program of hydrologic data for each year, such as snow pack information and precipitation, and an analysis to include critical combinations of hydrologic condition and demand characteristics. (Majtenji-IPA)
W79-01359

QUANTIFICATION OF RECREATIONAL USE OF THE CORALVILLE RESERVOIR,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 6B.
W79-01361

WATER RESOURCES OF THE UPPER HENRYS FORK BASIN IN EASTERN IDAHO.
Geological Survey, Boise, ID. Water Resources Div.
For primary bibliographic entry see Field 6D.
W79-01364

LOW-FLOW CHARACTERISTICS OF STREAMS IN THE ROCK-FOX RIVER BASIN, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 2E.
W79-01366

RUNOFF FROM HYDROLOGIC UNITS IN FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01368

Group 4A—Control Of Water On The Surface

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 2A: SOUTHERN FLORIDA, SURFACE WATER.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01370

WATER RESOURCES DATA FOR NEW HAMPSHIRE AND VERMONT, WATER YEAR 1977.
Geological Survey, Boston, MA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01372

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 1: NORTHEAST FLORIDA.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01373

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN MONTANA, OCTOBER 1977 THROUGH SEPTEMBER 1978.
Geological Survey, Helena, MT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01379

THE CASE OF THE SHRINKING CHANNELS-THE NORTH PLATTE AND PLATTE RIVERS IN NEBRASKA,
Geological Survey, Lakewood, CO. Water Resources Div.
G. P. Williams.
Circular 781, 1978. 48 p, 29 fig, 5 tab, 13 ref.

Descriptors: *Channel morphology, *Streamflow, *Discharge(Water), *Sedimentation, Braiding, Reach(Streams), Streambeds, Vegetation, Environmental effect, *Nebraska, *North Platte River(Neb), Platte River, *Channel shrinkage.

Since the latter part of the 19th century, channels of North Platte and Platte Rivers in western and central Nebraska have changed considerably. In the 365-km reach from Minatare to Overton, the channel by 2969 ws only about 0.1-0.2 as wide in 1865. The 1969 channel for this reach was less braided and slightly more sinuous than the 1938 channel. (No data are available for braiding and sinuosity prior to 1938.) From Overton to lGrand Island the 1969 channel was about o.6-0.7 as wide as in 1865, and various changes in braiding and sinuosity took place between 1938 and 1969. The decreases in channel width are related to decreases in water discharge. Such flow reductions have resulted primarily from regulating effects of major upstream dams and greater use of the river water. Much of the former river channel is now overgrown with vegetation. (Woodard-USGS)
W79-01380

HYDROLOGIC IMPACT OF LAND DRAINAGE ON ESTUARIES,
Geological Survey, Raleigh, NC Water Resources Div.
R. C. Heath.
In: Proceedings of Soil Moisture-Site Productivity Symposium, held in Myrtle Beach, South Carolina, November 1-3, 1977, p 250-261, 1977. 6 fig, 3 ref.

Descriptors: *Coastal marshes, *Drainage effects, *Aquatic habitats, *Estuaries, *Saline water-freshwater interfaces, Swamps, Canals, Hydrology, Shrimp, Oysters, Ecosystems, Land clearing, Evaluation, *North Carolina, Hyde County(NC), Tyrrell County(NC), Dare County(NC), Washington Counrty(NC).

Dense artificial drainage networks, consisting of about 20 miles of channel per square mile of area, presently under construction in the outer coastal zone of North Carolina, are having a significant impact on adjoining estuarines. The primary effect is the discharge of large volumes of freshwater from main canals to natural streams and bays which serve as vital links in the life cycles of marine organisms. The increased freshwater discharge decreases salinities in those areas, thus forcing marine organisms into areas less favorable to their survival. Possible solutions to the problem include moving outfall points or storing water during peak runoff periods. (Woodard-USGS)
W79-01385

REVIEW OF R & D ON WATER HYACINTH UTILIZATION IN THE PHILIPPINE REPUBLIC,
Battelle Columbus Lab., OH.
J. L. Otis, and M. E. D. Hillman.
Available from the National Technical Information Service, Springfield, VA 22161 as N77 25005, Price codes: A03 in paper copy, A01 in microfiche. Report No. BCL-OA-TFR-76-9, November 1976. 36 p, 4 fig, 7 tab, 2 append. Task 1, NASw-2800.

Descriptors: *Water hyacinth, *Beneficial use, *Defibering, *Monsod system, *Aquatic plants, Philippines, Eichhornia crassipes, Research and development, Harvesting, Feeds, Foods, Proteins, Pulp and paper industry, Fiber crops, Fibers(Plant), Methodology, Technology, Pesticides.

A system for defibering water hyacinth (Eichhornia crassipes) and using the plant for fiber, protein supplements, animal feeds, human foods, pesticides, vitamins and minerals, and medicines, developed by Filipino inventor Godofredo Monsod is evaluated. The investigation was severely limited by Monsod's refusal to permit viewing of actual operations and this report is based primarily on interviews, observations in some research facilities, a film of the defibering operation, and some data. While Monsod's cottage industry approach would not be particularly suited to industrialized countries, significant exploratory research nevertheless has been conducted into applications of hyacinth products, and the feasibility of defibering has apparently been demonstrated. Some results should be reconfirmed prior to major research and development commitments. The defibering operation uses a modified corn-milling machine with special processing techniques. Monsod claims 50-70% fiber recovery, or 80% with the inclusion of large quantities of parenchyma cells. Separation of the highly fibrous portion of the plant would probably eliminate several problems which have occurred when the whole plant has been used as a feedstock in pulp production, and defibering would improve the digestibility of the remainder as an animal feed protein supplement. Experimental hyacinth-based particle boards show promise. Little information was available on harvesting, drying, or aging. (Lynch-Wisconsin)
W79-01470

CORALVILLE WATER QUALITY STUDY ANNUAL REPORT, WATER YEAR OCTOBER 1, 1975 TO SEPTEMBER 30, 1976,
Iowa Univ. Iowa City, Inst. of Hydraulic Research.
For primary bibliographic entry see Field 5B.
W79-01473

4B. Groundwater Management

TRANSMISSIVITY AND HYDRAULIC CONDUCTIVITY OF SATURATED SEDIMENTARY ROCKS IN THE HANFORD RESERVATION,
Atlantic Richfield Hanford Co., Richland, WA.
For primary bibliographic entry see Field 8B.
W79-01053

CHARACTERISTICS OF INCINERATOR RESIDUE AND THE EFFECT OF ITS LEACHATE ON GROUNDWATER QUALITY,
Connecticut Univ. Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 5B.
W79-01090

REMOTE SENSING OF WATER LEVELS IN SMALL-DIAMETER WELLS,
Southern Piedmont Conservation Research Center, Watkinsville. GA.
For primary bibliographic entry see Field 7B.
W79-01101

A WATER WELL EVALUATION SYSTEM,
For primary bibliographic entry see Field 8B.
W79-01102

REGIONAL GROUND-WATER MANAGEMENT,
California Univ., Davis. Dept. of Civil Engineering.
O. J. Helweg.
Ground Water, Vol. 16, No. 5, p 318-321, September-October, 1978. 7 fig, 7 ref.

Descriptors: *Water management(Applied), *Aquifer management, *Storage capacity, *Water quality, Drawdown, Irrigation practices, Optimization.

Aquifers are essentially underground water storage reservoirs. Five properties dictate how aquifers should be used in water management. These are: (1) the size or storage volume; (2) the 'response time' or the time it takes for ground water to move out of the reservoir; (3) the quality of the ground water; (4) the ecological impacts when used; and (5) the cost of operation and maintenance involved in developing them. Because of the long response time of aquifers; the rate at which they fill up does not fluctuate as widely as stream flow. However, we are not making optimum use of the storage capacity of aquifers by not pumping enough water. What is not used eventually is lost to rivers as runoff. Ground-water laws may not allow aquifers to be drawn down optimally. Ground-water degradation due to irrigation may irreversibly destroy the aquifer. Managing ground-water quality requires regional control. A good example is the Accelerated Salt Transportation (ASTRAN) method which distributes the various available irrigation waters in such a way so that a water quality gradient is maintained between applied irrigation water and underlying ground water. Fresh water aquifers, in general, have not been used to their fullest capability and in many areas are being abused. (Purdin-NWWA)
W79-01105

THE USE OF INCLINED BOREHOLES FOR WELL DEVELOPMENT,
Institute of Geological Science, London, (England).
For primary bibliographic entry see Field 8B.
W79-01107

DIRECT INJECTION OF RECLAIMED WATER INTO AN AQUIFER,
Stanford Univ., CA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W79-01108

USING LARGE DIAMETERS TO INCREASE WELL STORAGE,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 8B.
W79-01109

DRILLING LARGE DIAMETER WELLS: THE PROOF IS IN THE PLANNING,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 8B.
W79-01110

CITIZEN PARTICIPATION FOR SUCCESSFUL VILLAGE WATER SUPPLY,
For primary bibliographic entry see Field 6B.
W79-01112

THE IMPACT OF HAZARDOUS WASTES ON GROUND WATER: PART II,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 5B.
W79-01113

THE EXPANDING GEYSERS,
L. Quenet.
Electrical World, Vol. 189, No. 7, April 1, 1978. 6 fig.

Descriptors: *Geothermal studies, *Thermal powerplants, *Drilling, Steam, Electric power, Injection, Hydrogen sulfide, Operating costs, Hot springs.

In 1922, drillers successfully tapped pressurized, clean, dry steam in the subsurface fractures and pockets of the Geysers. However, due to technological and economic difficulties, this project was abandoned for over 30 years. In 1960, the first 11-Mw turbogenerator unit produced power. By the end of 1979, there will be 15 units generating 908 Mw and by 1989 25 units generating 2000 Mw. At the Geysers, a field is developed by drilling a cluster of wells. The well-drilling technique is similar to that of natural-gas drilling but a new technology had to be developed to deal with harder rock formations, higher temperatures, and abrasive conditions. Geothermal steam must have a temperature of 350 degrees F and a pressure of 100 psi. Generally, it cannot be transported more than one mile from its source due to temperature and pressure losses. Excess water from the cooling process is reinjected into the ground alongside the original steam wells. This avoids surface water pollution and maintains the water table. Air pollution due to hydrogen sulfide in the steam is eliminated with an iron-catalyst process. The total operating cost pe Kwhr of The Geyses is lower than that of gas/oil-burning plants, coal-fired plants, or nuclear plants. (Purdin-NWWA)
W79-01116

THE MANAGEMENT OF GROUNDWATER SUPPLIES,
Ground Water Consultants Group, Edmonton (Alberta).
P. L. Hail.
Water and Sewage Works, Vol. 125, No. 10, p 54-55, October, 1978 1 fig.

Descriptors: *Water management(Applied), *Groundwater resources, *Water demand, Water wells, Long-term planning, Optimization, Artificial recharge, Conjunctive use, Computer models, Aquifers.

The objectives of a ground-water management program are: (1) To meet demands; (2) To optimize water resources and existing distribution systems; and (3) To develop ling-range plans. The physical limitations of the aquifer must be known to ensure a constant supply of good quality water and a reserve supply to meet peak demands or breakdowns. Many existing well fields are not operating at maximum efficiency. Well efficiency can be determined by running short pumping tests on each well and comparing the results with those of earlier tests. Encrustations of a well screen will reduce efficiency but usually can be removed by acid treatment. Long-range planning involves the prediction of demands and the development of plans to meet projections. New wells should be constructed and tested ahead of demands and brought into operation when needed. The aquifer capacity should be determined to avoid overdevelopment. Recharge areas should be constructed and tested ahead of demands and brought into operation when needed. The aquifer capacity should be determined to avoid overdevelopment. New wells should be constructed and tested ahead of demands and brought into operation when nneded. The aquifer capacity should be determined to avoid overdevelopment. Recharge areas should be located and protected from contamination hazards. Artificial recharge and conjunctive use of ground water and surface water may be necessary when demands exceed supply. The use of analog and digital computer models to evaluate well field performance will facilitate the development of management schemes. Just how accurate the models are depends on the quality of input data. (Purdin-NWWA)
W79-01117

GROUNDWATER LAW: MORE QUESTIONS THAN ANSWERS,
For primary bibliographic entry see Field 6E.
W79-01118

WELL LOGS...ARE THEY REALLY NECESSARY,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 7C.
W79-01119

A NONSTRUCTURAL APPROACH TO CONTROL SALT ACCUMULATION IN GROUND WATER,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W79-01132

THE LEGALIZATION OF GROUNDWATER SHORTAGE,
Southern California Metropolitan Water District, Los Angeles.
For primary bibliographic entry see Field 6E.
W79-01142

NATIONAL WATER COMMISSION VIEWS GROUNDWATER PROTECTION,
For primary bibliographic entry see Field 5G.
W79-01155

STATE APPROACH TO GROUNDWATER QUALITY PROTECTION: THE ILLINOIS EXPERIENCE,
Illinois Environmental Protection Agency, Springfield. Div. of Land Pollution Control.
For primary bibliographic entry see Field 5G.
W79-01156

PRINCIPLES FOR WATER QUALITY MANAGEMENT,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5G.
W79-01165

LEGAL AND INSTITUTIONAL PLANNING FOR MACRO-CONSERVATION MEASURES,
Denver Univ., CO. Coll. of Law.
For primary bibliographic entry see Field 6E.
W79-01227

ENERGY CONSERVATION: IS THE HEAT STORAGE WELL THE KEY.,
General Electric Co., Santa Barbara, CA.
W. Hausz, and C. F. Meyer.
Public Utilities Fortnightly, Vol. 95, No. 9, p 34-38. April 24, 1975. OWRT C-5205(No. 4210)(3), 14-31-0001-4210.

Descriptors: *Thermal energy, *Thermal water, *Heat transmission, *Heat transfer, *Underground water storage, Pipelines, Thermodynamics, Waste heat, Heat losses, Electric powerplants, Plant efficiencies, Injection wells, Groundwater, *District heating, *Thermal energy storage, Telethermics, Efficient use of energy.

The maximum amount of heat energy that can be converted to electricity in modern power plants is approximately 40%. The remaining 60% is almost always dumped into air or water as useless low-temperature heat. High-grade heat, supplied by combustion at 3000F, is diluted with air or water so that there is little potential to get work from the low-grade heat after it has been used for space heating, hot water, and industrial process heat. Combined power and heat production is practiced, but on a limited scale. Of the 6,900 billion kilowatt-hours thermal used in the U.S. each year for low-grade heat, less than 0.5% is currently served by district heating systems. Over 4,000 billion kilowatt-hours thermal are rejected from electric utility generating stations; thus, the conservation opportunities are substantial. Coupling power and heat production requires massive storage of heat energy to bridge seasonal variations in power and heat demands. The Heat Storage Well appears to be a viable approach to storage of large amounts of heat for long periods of time, at low cost, and with low loss. Turbines running on fossil-fuel or nuclear steam supplies can be designed to exhaust at temperatures of 350F. Large amounts of water at 300-350F can be transmitted for distances of up to 100 miles, as is being done in several European countries, at costs comparable to overhead transmission of equivalent electrical energy. The cost of the Heat Storage Well is estimated to be $3 to $8 per thermal kilowat, much lower than the $15 to $40 per thermal kilowatt for dry cooling towers that may be replaced. The operating (pumping power) cost of Heat Storage Wells is approximately tow cents per million Btu's stored and withdrawn.
W79-01228

HEAT STORAGE WELLS CONSERVE FUELS,
General Electric Co., Santa Barbara, CA.
W. Hausz.
In: Symposium Papers - Efficient Use of Fuels in the Metallurgical Industries, Presented at III Research Institute, Chicago, Illinois. December 9-13, 1974, p 185-201, Institute of Gas Technology. Chicago, Illinois, February 1975. OWRT C-5205(No4210)(1), 14-31-0001-4210.

Descriptors: *Underground water storage, *Usable storage, *Thermal energy, *Thermal water, *Heat transmission, *Heat transfer, High temperature, Confined aquifers, Pipelines, Thermodynamics, Waste heat, Heat losses, Heat balance, Electric power plants, Plant efficiencies, Injection wells, Thermal power, Groundwater, *District heating, *Thermal energy storage, Efficient use of fuels, Telethermics.

The thermodynamic and pragmatic merits of extracting maximum work as well as heat energy are reviewed and the feasibility of achieving up to 85% efficiency with total-energy and heat-and-power utilities is examined. Extensive European use of high-temperature water (e.g., at 350 degrees F) for district heating is described. For most effective coordination of the seasonal and daily variations of demand for heat and electricity, massive low-cost storage of heat is required. Underground storage of high-temperature water in confined aquifers is proposed as a solution. Heat energy at a 24-megawatt rate (1 mgd at 350 degrees F) can be injected for 90 days and recovered during the following 90 days with an expected energy loss of about 20%. Storage cost is estimated at 10 cents per million BTU. Transmission cost via large pipes carrying high-temperature water from central stations to load centers is estimated to be less than $1/million BTU/100 miles. This is comparable to the cost when overhead electric transmission lines are used.
W79-01230

INVESTIGATION OF HEAT TRANSFER COEFFICIENTS OF WORKING FLUIDS IN GEOTHERMAL POWER CYCLES,
California Univ., Berkeley. Sea Water Conversion Lab.
B. W. Tleimat, and A. D. K. Laird.
Transactions, Geothermal Resources Council, Vol 2, Fig 2 p 655-657. July 1978. (California Water Resources Center Desalination Project).

Descriptors: *Heat transfer, *Geothermal studies, *Thermal water.

The objective of the binary fluid experiment described is to obtain data to determine baseline heat transfer data for working fluids being considered for binary cycle systems to produce power from hot geothermal brines. These data will be used to calculate film coefficients for heating, boiling, superheating, desuperheating as well as condensation for candidate working fluids. (Snyder-Calif, Davis).
W79-01279

MANUAL OF INDIVIDUAL WATER SUPPLY SYSTEMS.
Environmental Protection Agency, Washington, DC. Office of Water Programs.
For primary bibliographic entry see Field 5F.
W79-01311

WATER RESOURCES OF THE UPPER HENRYS FORK BASIN IN EASTERN IDAHO.
Geological Survey, Boise, ID. Water Resources Div.
For primary bibliographic entry see Field 6D.
W79-01364

LAND SUBSIDENCE IN THE SANTA CLARA VALLEY,
Geological Survey, Sacramento, CA. Water Resources Div.
For primary bibliographic entry see Field 2F.
W79-01365

PROBABLE YIELDS OF WELLS IN THE NIAGARA AQUIFER, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01367

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 2B: SOUTHERN FLORIDA, GROUND WATER.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01371

WATER RESOURCES DATA FOR NEW HAMPSHIRE AND VERMONT, WATER YEAR 1977.
Geological Survey, Boston, MA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01372

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 1: NORTHEAST FLORIDA.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01373

DIGITAL-MODEL SIMULATION OF THE GLACIAL-OUTWASH AQUIFER, OTTER CREEK-DRY CREEK BASIN, CORTLAND COUNTY, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 2F.
W79-01377

GAS-DRIVEN PUMP FOR GROUND-WATER SUPPLIES,
Geological Survey, Lubbock, TX. Water Resources Div.
For primary bibliographic entry see Field 8C.
W79-01378

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN MONTANA, OCTOBER 1977 THROUGH SEPTEMBER 1978.
Geological Survey, Helena, MT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01379

HYDROGEOLOGIC MAPS OF A FLOOD DETENTION AREA PROPOSED BY SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT GREEN SWAMP AREA, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01383

GROUND-WATER RESOURCES AND GEOLOGY OF COLUMBIA COUNTY, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 2F.
W79-01384

KOHL SPRING - BIOGEOCHEMISTRY OF A BLACKWATER SYSTEM,
Missouri Univ.-Columbia.
For primary bibliographic entry see Field 5B.
W79-01421

TRICHLOROFLUOROMETHANE, A NEW HYDROLOGIC TOOL FOR TRACING AND DATING GROUND WATER,
Indiana Univ. at Bloomington.
For primary bibliographic entry see Field 2F.
W79-01422

4C. Effects On Water Of Man's Non-Water Activities

CONTROLLING EROSION ALONG HIGHWAYS WITH VEGETATION OR OTHER PROTECTIVE COVER,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agronomy.
For primary bibliographic entry see Field 4D.
W79-01059

SIMULATION OF FLOOD WAVES IN CHANNELS,
Bristol Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W79-01060

EVALUATION OF DESIGN METHODS OF SUBSURFACE DRAINAGE FACILITIES FOR HIGHWAYS,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
G. M. Slaughter.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 364, Price codes: A09 in paper copy, A01 in microfiche. Report FHWA-PO-122, Feb. 1973. 193 p, 56 fig, 16 tab, 90 ref, 4 app.

Descriptors: *Drainage, *Subsurface drainage, *Highways, *Drainage practices, Drainage engineering, Tile drainage, Infiltration, Drains, Tile drains, Surveys, Engineering, Civil engineering, Highway drainage.

The primary purposes of this study were to evaluate the methods used by the State Highway Department of Georgia for the design of highway subsurface drainage facilities, to compare these methods with what other states are doing, and to recommend, if applicable, research projects and/or additional studies which would lead to an improvement in these methods. The study consisted mainly of a library search and the analysis of two questionnaires on subsurfce drainage. The qustionnaires were sent to the 50 State Highway Departments plus District of Columbia and Puerto Rico. What Georgia is doing in connection with subsurface drainage is in keeping (for the most part) with what other states are doing. No two states have evolved to exactly the same place in their approach to solving the problem of subsurface drainag. In general, the highway departments have not kept abreast with many of the advances in problem solving techniques for flow through porous media. Recommendations were made which outlined research projects. Basically, these recommendations amounted to better utilization of the aformentioned problem solving techniques and more effort expended in obtaining better data for design and verification of the design models. (Sims-ISWS)
W79-01061

THE EFFECTS OF LAND USE ON PHOSPHORUS LOADING: A CASE STUDY - SIX MILE RUN RESERVOIR,
Rutgers University Dept. of Environmental Science New Brunswick, New Jersey.
For primary bibliographic entry see Field 5C.
W79-01086

CHARACTERISTICS OF ARIZONA PONDEROSA PINE STANDS ON SANDSTONE SOILS,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 2I.
W79-01099

TAP WATER AND TIMBER - THE COSTS OF MULTIPLE USE,
For primary bibliographic entry see Field 5G.
W79-01166

MAN'S IMPACT ON THE BARRIER ISLANDS OF NORTH CAROLINA,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 6G.
W79-01220

HIGHWAY CONSTRUCTION IMPACT ON WATER-SUPPLY LAKES,
Interprovincial Engineering Ltd., Halifax (Nova Scotia).
K. H. Tan, and D. Thirumurthi.
American Society of Civil Engineers, Journal of the Environmental Engineering Division, Vol. 104, No. EE5, Proceedings Paper 14052, p 997-1011, October 1978. 13 fig, 3 tab, 6 ref.

Descriptors: *Construction, *Water supply, *Highways, *Canada, Deicers, Gabions, Lakes, Nutrients, Roads, Runoff, Salts, Water pollution, Water quality, Environmental effects, Environmental control, *Highway construction, Ice removal, Water-supply lakes, Soil loss.

A unique opportunity existed and was taken advantage of, in Halifax, to assess the environmental impact of highway construction on four water supply lakes (Long Lake, First Chain Lake, Second Chain Lake, and Withrod Lake), two of which were as close as 30 ft (10 m) from the proposed highway. Although the water qualities of Long and Chain Lakes have not deteriorated significantly as a result of construction, certain parameters such as conductivity, chloride, and total organic carbon have been increasing throughout the study period, indicating the increasing uses of the watersheds. The gabions, intended to be the pollution control devices, were not effective in reducing the suspended impurities in the runoff because the surface runoff bypassed the gabions in some cases, and the poor sizes of the gabion structures were too coarse to effectively filter the water in other cases. However, sand bags installed near the First Chain Lake were successful in diverting runoff from the construction site and, thus, reduced the pollution load entering that lake. (Lee-ISWS)

W79-01260

THE EFFECT OF FIRE ON SPECIES COMPOSITION IN CYPRESS DOME ECOSYSTEMS,
Florida Univ., Gainesville. School of Forest Resources and Conservation.
K. C. Ewel, and W. J. Mitsch.
Florida Scientist, Vol. 41, No. 1, p 25-31, Winter, 1978. 1 fig, 1 tab, 17 ref.

Descriptors: *Swamps, *Burning, *Florida, *Cypress trees, Wetlands, Effects, Pine trees, Trees, Hardwood, Ecology.

Cypress trees were more successful than pines and hardwoods in surviving a fire which destroyed 42% of the trees in two cypress dome ecosystems. Cypress trees had comprised nearly half of the trees in the domes, which had been drained for several years. After the fires, an average of 89% of the trees were cypress, 9% were hardwoods, and 2% were pines. The majority of cypress trees burned put out adventitious branches, and some of the more severly damaged trees survived by coppicing. Greatest mortality occurred in the center of the dome where organic matter was deepest. The existence of an open central pool in many cypress domes may be, in part, the result of occasional fires. (Stihler-Mass)
W79-01292

WATER RESOURCES AND THE LAND-WATER INTERFACE,
Illinois Univ. at Urbana-Champaign. Dept of Ecology, Ethology, and Evolution.
For primary bibliographic entry see Field 6E.
W79-01295

WATER QUALITY: PROBLEMS AND RESEARCH NEEDS,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 6B.
W79-01348

THE WATER FACTOR IN THE SOCIAL HISTORY OF HONOLULU, HAWAII,
Hawaii Univ., Honolulu.
For primary bibliographic entry see Field 6B.
W79-01353

HYDROLOGIC IMPACT OF LAND DRAINAGE ON ESTUARIES,
Geological Survey, Raleigh, NC Water Resources Div.
For primary bibliographic entry see Field 4A.
W79-01385

THE IMPACT OF LOGGING ON SALMONID RESOURCES IN THE PACIFIC NORTHWEST,
Washington Univ., Seattle. Fisheries Research Inst.
C. J. Cederholm.
In: Twenty-Eighth Northwest Fish Culture Conference, Dec. 6-8, 1977, p 101-111, 49 ref.

Descriptors: *Salmon, *Land clearing, Land development, Land use, Large watersheds, Pacific Northwest United States, *Pacific Coast Region, Recreation, Road construction, Herbicides, Nutrients, Idaho, Alaska, Oregon, British Columbia, Washington, *Logging, *Logging practices, *Fisheries resources, Log storage, Forest canopy, Residue removal.

To the casual observer, logging and its associated disturbances must cause unquestionable damage to the fisheries resources; however, quantitative research directed toward documenting these apparent impacts under natural conditions have met with surprisingly few definitive results. Often logging effects are masked by natural climatic fluctuations, overharvest in the commercial and sport fisheries, and other man-related disturbances. Also, logging impacts can be subtle and thus difficult to detect in short-term studies using the sampling tools available to the fishery biologist today. Since the 1950's, a number of agencies throughout the Northwest have become increasingly involved with research into the negative effects of logging practices on fish and their habitats. Literature is extensive in Idaho, Alaska, Oregon, British Columbia, and Washington. Surprisingly few studies have looked at the possible beneficial effects of controlled logging, although some noted authors have mentioned this possibility. There seems to be a recent change in attitude favoring prevention through 'Best Management Practices' rather than rehabilitation after non-compliance with questionable standards. Some logging practices have been found to cause degradation to the watersheds and result in impacts to salmonid resources. For convenience, logging activities with potential to impact fisheries resources can be divided into four categories: (1) road construction and maintenance; (2) canopy and residue removal; (3) addition of chemicals including herbicides and fertilizers; and (4) log storage and transportation. (EIS-Katz)
W79-01466

4D. Watershed Protection

CONTROLLING EROSION ALONG HIGHWAYS WITH VEGETATION OR OTHER PROTECTIVE COVER,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agronomy.
D. L. Wright, H. D. Perry, and R. E. Blaser.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 093, Price codes: A05 in paper copy, A01 in microfiche. Report FHWA-VA-77-517, August 31, 1976. 79 p, 43 tab.

Descriptors: *Erosion control, *Highways, *Vegetation establishment, Erosion, Water pollution, Water pollution sources, Bank protection, Bank stability, Embankments, Soil stabilization, Grading, Mulching, Soil amendments, Vegetation, Fertilizers, Planting management, Seeds, Legumes, Agronomy.

Construction operations in highway corridors disturb the natural vegetation and land contours, causing potential erosion sites if left denuded. Minimizing erosion on these areas is based on the principles of maximizing water infiltration and reducing water runoff obtainable with rough and stair-step grading to establish vegetative cover quickly. Rough grading is augmented temporarily by mulches until fast growing temporary canopies develop. Establishing and developing desirable vegetative covers depends on grading and soil preparation, soil amendments, mulches, and changing seed mixtures with seasons. Woodfiber applied at 750 lbs/A as a tacking agent for straw has provided a persistent mulch for winter seedings that is equal to or better than asphalt applied at 300 gal/A. The manipulation of these managements, through plant succession, leads to the development of a near maintenance free vegetation that needs little mowing and little or no fertilizer as with crownvetch, flat pea, and sericea. Harsh environments often have partial vegetative covers and multi-step seeding, and fertilization is required to develop protective vegetative canopies. Adequate soil amendments applied to a properly prepared seedbed eliminate the need for topsoil which is often of poor quality. Sparsely vegetated grass slopes may be eliminated by overseeding with legumes, phosphorus, lime, and mulches in favorable seeding seasons. (Sims-ISWS)
W79-01059

SIMULATION OF SOIL EROSION IN THE PALOUSE PRAINE OF THE PACIFIC NORTHWEST,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
K. H. Yoo.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 703, Price codes: A07 in paper copy, A01 in microfiche. Idaho Water Resources Research Institute Research Technical COmpletion - Report, June 1978. 115 p, 16 fig, 21 tab, 38 ref. OWRT A-047-IDA(1), 14-34-001-5012.

Descriptors: Runoff, Models, *Erosion, Overland flow, *Pacific northwest, Rill erosion, Watersheds(Basin), *Soil erosion, Idaho, Washington, Rainfall, Snowmelt, Soil moisture, *Palouse Prairie(Ida-Wash).

A soil erosion study was conducted to help understand soil loss from agriculture lands in the Palouse Praire of the pacific Northwest. A soil erosion model was coupled with the Idaho version of the USDAHL watershed model. The model was tested on 2 different size watersheds. The monthly and yearly simulations were good compared with the observed data except for the period of high stream flow simulated at the start of the water year. The eroded particles from each hydrologic zone cascade to a lower zne and finally to the channel. This cascading system shows the amount and location in terms of zones, where the erosion and deposition occur. Rill depth and distribution for any erosion period are the most important part of the model since rill erosion is calculated as a function of them. From field measurements, rill erosion is one of the most serious erosion sources in the Palouse. Channel scouring erosion is not as significant as upland erosion. High stream flow does not necessarily cause high soil loss and vice versa. Many of the problems, particularly with upland erosion, can be traced to inadequacies in the hydrologic model.
W79-01087

PRE-MANAGEMENT ASSESSMENT OF AQUATIC MACROINVERTEBRATES IN A SMALL, SEDIMENTARY DRAINAGE AREA OF THE MAUMEE AND LAKE ERIE BASIN.
Purdue Univ., Lafayette, IN. Dept. of Entomology.
For primary bibliographic entry see Field 5C.
W79-01096

CHARACTERISTICS OF ARIZONA PONDEROSA PINE STANDS ON SANDSTONE SOILS,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 2I.
W79-01099

IMPACT OF FLOODS AND ALTERNATIVE FLOOD CONTROL MEASURES ON THE DEVILS LAKE BASIN ECONOMY,
North Dakota State Univ., Fargo. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W79-01122

EFFECT OF MULCHING ON SEDIMENT IN RUNOFF FROM SIMULATED RAINFALL,
California Univ., Davis. Dept. of Land, Air and Water Resources.
M. J. Singer, and J. Blackard.
Soil Science Society of America Journal, Vol. 42, No. 3, p 481-486. May-June 1978. 2 fig, 3 tab, 22 ref. (California Water Resources Center Project UCAL-WRC-W-502).

Descriptors: *Erosion, *Soil erosion, *Mulching, Erosion control, Simulated rainfall, Sediments, Runoff.

Simulated rainfall was used to test the relationship between sediment in runoff and percentage of the soil that was mulch covered. Oak leaves (Quercus Douglasii H. & A.), redwood litter (Sequoia sempervirens (D. Don) Endl.) and oat straw (Avena barbata Brot.) were used as mulches on a 0.37m2 plot of Auburn (loamy, mixed, thermic, Ruptic-Lithic Xerochrepts) surface soil at a 9% slope. Cover percentage was related to sediment in surface runoff by a parabolic relationship. The relationship between redwood and oak covers and sediment in runoff was not significantly different, but both were significantly different from oat straw. Cover shape or distribution of inter-cover space appears to be important in affecting sediment

loss. Runoff volume was significantly reduced by high cover levels which protected the soil from sealing and helped maintain a high infiltration rate. (Snyder-Calif, Davis)
W79-01130

EVALUATION OF WILD OAT STRAW AS A SOIL EROSION RETARDANT USING SIMULATED RAINFALL,
California Univ., Davis. Dept. of Land, Air and Water Resources.
M. J. Singer, and J. Blackard.
Agronomy Journal, Vol. 69, p 811-814. Sept.-Oct. 1977, 3 fig, 2 tab, 15 ref. (California Water Resources Center Project UCAL-WRC-W-502).

Descriptors: Erosion, *Range management, Mulch, Runoff, *Soil erosion, Oat straw, Erosion control.

Soil cover is an important factor in soil erosion control. This study was made to determine the quantitative relationship between cover percent for one cover type and soil loss under simulated rainfall. Data from this experiment are used to calculate a cover coefficient for wild oat (Avena barbata Brot.) straw similar to the 'C' factor in the Wischmeier Universal Soil Loss Equation (USLE). The R,K,L,S, and P factors were kept constant during the experiment. A rainfall simulator was used in the laboratory to produce 30 min rainfall events of 76 mm/hour (3 in/hour) intensity on soil material at 9% slope. Under these conditions, wild oat straw significantly reduced sediment loss at cover levels of 50% or more. A significant reduction in runoff volume was observed for cover percentages exceeding 90%. A parabolic regression model Y = 158.4 - 0.051X - 0.014X2 which describes the relationship between Y sediment loss and X percent cover (0 to 100) was highly significant R2 = 0.81. The effect of the straw was to (1) reduce splash, (2) reduce soil crust formation, (3) block sediment movement, (4) delay runoff initiation, and (5) reduce total runoff loss. A cover coefficient (CC) can be calculated as a ratio of soil loss under any straw cover percent to soil loss under no straw cover. The relationship needs to be tested for other cover types before it is used with cover types different than straw mulch, or substituted for the C factor of the Wischmeier equation. (Snyder-Calif, Davis)
W79-01131

GUIDELINES FOR MANDATORY EROSION CONTROL PROGRAMS,
Wisconsin Univ.-Madison.
For primary bibliographic entry see Field 5G.
W79-01160

SOIL EROSION CONTROL POLICIES - INSTITUTIONAL ALTERNATIVES AND COSTS,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W79-01164

ESTIMATION OF WATER BALANCE OF LOWER SUTLEJ CATCHMENT UP TO BHAKRA DAM SITE BY THORNTHWAITE'S METHOD,
Meteorological Office, New Delhi (India).
For primary bibliographic entry see Field 4A.
W79-01257

OPTIMAL OPERATION OF LARGE AGRICULTURAL WATERSHEDS WITH WATER QUALITY CONSTRAINTS,
Texas A and M Univ., College Station. Water Resources Inst.
J. R. Williams, and R. W. Hann, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 942, Price codes: A08 in paper copy, A01 in microfiche. Technical Report No. 96, April 1978. 152 p, 7 fig, 16 tab, 50 ref. OWRT A-999-TEX(6).

Descriptors: *Watershed management, *Model studies, *Agricultural watersheds, *Optimization, *Computer models, Agricultural runoff, Sediment, Phosphorus, Nitrogen, Linear programming, Computer programs, Programming languages, Small watersheds, Crop production, Fertilizers, Decision making, Hydrograph analysis, Runoff, Routing, Water management(Applied), Land use, Optimum development plans.

A number of models were developed for use in managing large agricultural watersheds to obtain maximum agricultural production and maintain water quality standards. Special attention was given to models simulating daily runoff and sediment, phosphorus, and nitrogen which are considered the three most important agricultural pollutants. Frequency relationships were determined for these parameters for small watersheds up to 40 sq km in area. A model was developed for routing sediment, phosphorus, and nitrogen through streams and valleys of large watersheds with areas up to 2500 sq km and a problem-oriented computer language, SPNM, was developed for modeling sediment, phosphorus, and nitrogen yields. Another model, based on decision analysis and linear programming was developed to determine optimal operating policies for large watersheds. Strategies specifying the crop to be grown, fertilizer application rate, and type of conservation system were selected for each land class within each sub-watershed and the utility of each was determined by analyzing attributes important to decision makers. Linear programming is used to determine the optimal combination of strategies for the entire watershed. The overall combination of models was demonstrated with data from Little Elm Creek watershed and realistic resuls were obtained. (Majtenyi-IPA)
W79-01355

GEOMORPHOLOGIC CHARACTERISTICS OF FOURTEEN INDIANA WATERSHEDS OBTAINED FROM A COMPUTER DATA BANK OF STREAM NETWORKS,
Purdue Univ., Lafayette, IN. School of Civil Engineering.
J. W. Delleur, and M. T. Lee.
Proceedings of the Indiana Academy of Sciences. Vol 83. p 196-203, 1974. 4 fig, 2 tab, 6 ref. OWRT B-008-IND(15).

Descriptors: *Geomorphology, *Indiana, *Streams, *Watershed basins, Watershed management, Drainage density, Drainage area, Stream ordering, Bifurcation ratio, Strahler.

Twenty-eight geomorphologic properties were obtained for each of 14 Indiana watersheds. These properties are based on Strahler's stream ordering system and on Shreve's stream link magnitude system. The laws of the stream numbers and of the stream lengths, in general, were found to be valid. The bifurcation ratio has a nearly constant value of about 4.5, almost equal to the ideal network value. The mean first-order stream length ranges from 0.08 to 0.13 miles, a comparatively low value due to the detail of the maps used. The drainage area is strongly correlated to the stream length and is inversely related to the watershed slope. Weaker correlations exist between the drainage area and the drainage density and between the drainage area and the texture ratio.
W79-01426

AN ECONOMIC EVALUATION OF CROPLAND USE AS A CONTROL FOR SEDIMENT NONPOINT POLLUTION,
Iowa Agriculture and Home Economics Experiment Station, Ames.
For primary bibliographic entry see Field 5G.
W79-01498

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

CAN SALAMANDERS AND FROGS SURVIVE THE THREAT OF ACID PRECIPITATION,
Cornell Univ., Ithaca, NY.
For primary bibliographic entry see Field 5C.
W79-01005

RECOVERY OF NITROSAMINES FROM WATER,
Cornell Univ., Ithaca, NY. Lab of Soil Microbiology.
For primary bibliographic entry see Field 5D.
W79-01006

PRECISION ANALYSIS FOR WATERBORNE CHRYSOTILE ASBESTOS BY TRANSMISSION ELECTRON MICROSCOPY,
Illinois Univ. at the Medical Center, Chicago.
W. H. Hallenbeck, E. H. Chen, K. Patel-Mandlik, and A. H. Wolff.
Bulletin of Environmental Contamination and Toxicology, Vol. 17, No. 5, p 551-558 1977. 5 tab, 30 ref. OWRT A-071-ILL(2).

Descriptors: *Asbestos, *Analytical techniques, *Pollutant identification, Water analysis, Chrysotile, *Electron microscopy, Analysis.

Detailed examinations of water samples were carried out to determine the precision ofanalysis for chrysotile asbestos by transmission electron microscopy (TEM). Since the frequency distribution of counts fits a Poisson distribution, several statistical inferences were made, including (1) an estimate of precision, and (2) a model for determining the probability of observing chrysotile as a function of its concentration in water and magnitude of area scanned by TEM.
W79-01010

DISTRIBUTION OF TRACE METALS AND SEDIMENTS IN ESTUARIES OF THE KUM RIVER AND THE MANKYUNG RIVER,
Seoul National Univ. (Republic of Korea). Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W79-01014

BIOASSAYS ON MARINE ORGANISMS: ACUTE TOXICITY TEST OF MERCURY, CADMIUM, AND COPPER TO ARKSHELL, ANADARA BROUGHTONII, FROM JIN-DONG BAY, AND TO OYSTER, CRASSOSTREA GIGAS, FROM KWANGDO BAY, SOUTH COAST OF KOREA,
National Fisheries Research and Development Agency, Seoul (Republic of Korea).
For primary bibliographic entry see Field 5C.
W79-01015

A BIOLOGICAL INVESTIGATION OF AN ORGANICALLY POLLUTED URBAN STREAM IN VICTORIA,
Monash Univ., Clayton (Victoria). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W79-01016

POLLUTION STUDIES OF RIVER KHAN (INDORE) INDIA -- I. BIOLOGICAL ASSESSMENT OF POLLUTION,
Vikram Univ., Ujjain (India). School of Studies in Botany.
S. V. R. Rao, V. P. Singh, and L. P. Mall.
Water Research, Vol. 12, p 555-559, 1978. 3 fig, 3 tab, 22 ref.

Descriptors: *Water quality, *Bioindicators, *Trophic level, Monitoring, Water analysis, Water chemistry, Chemical analysis, Benthic fauna, Biological communities, Phytoplankton, Aquatic algae, Diatoms, Cyanophyta, Chlorophyta, Tubificids, *Saprobic system, *India, *River Khan(Indore).

Pollution studies of the River Kahn, Indore (India) have been made, with an emphasis on the biological assessment of water quality. This study covers a critical analysis and testing of various European methods for the biological monitoring of water pollution. The biological data have been correlated with the chemical data and the practical implications of the European saprobity system under Indian conditions have been discussed. The importance of benthic macro-invertebrates in the assessment of water quality in the river has also been discussed. (EIS-Deal)
W79-01018

UPTAKE AND RELEASE OF PETROLEUM BY INTERTIDAL SEDIMENTS AT PORT VALDEZ, ALASKA,
Alaska Univ., Fairbanks. Inst. of Marine Science.
For primary bibliographic entry see Field 5B.
W79-01022

UPTAKE OF ZINC BY THE AQUATIC LARVAE OF SIMULIUM ORNATIPES (DIPTERA: NEWATOCERA),
Australian National Univ., Canberra. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W79-01026

DISSOLVED MERCURY IN THE LAKE WINDERMERE CATCHMENT AREA,
Liverpool Univ. (England). Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W79-01040

AN IMPROVED HYDRAZINE REDUCTION METHOD FOR THE AUTOMATED DETERMINATION OF LOW NITRATE LEVELS IN FRESHWATER,
Department of Scientific and Industrial Research, Taupo (New Zealand). Ecology Div.
M. T. Downes.
Water Research, Vol. 12, No. 9, p 673-675, 1978. 4 fig, 6 ref.

Descriptors: *Nitrates, *Sampling, *Chemistry analysis, *Automation, Equipment, Instrumentation, Calibrations, Evaluation, Analytical techniques, Water pollution, Water pollution sources, Pollutants, Freshwater, Pollutant identification.

An automated nitrate determination was described in which nitrate is reduced to nitrite with hydrazine sulphate under alkaline conditions in the presence of Cu(2+) and Zn(2+). Interferences encountered in natural water samples were eliminated by the addition of Zn(2+) to the Cu(2+) catalyst solution. The method is suitable for the determination of low NO3-N concentrations and compares favorably with the manual copperized cadmium techniques for freshwater samples containing 10-800 mg/cu m NO3-N. The method is also linear at nitrate concentrations below 10 mg N/cu m. The standard deviations of blanks and of samples containing 2 mg NO3-N/cu m were 0.013 and 0.06 mg N/cu m, respectively, at an analysis rate of 30 samples/h. (Sims-ISWS)
W79-01042

QUANTITATIVE DETERMINATION OF QUATERNARY AMMONIUM BASES (QAB) IN WATER AND WASTEWATER BY THIN LAYER CHROMATOGRAPHY,
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
E. R. Michelsen.
Tenside Detergents, Vol. 15, No. 4, p 169-175, July-August, 1978. 5 fig, 5 tab, 16 ref, 1 append.

Descriptors: *Surfactants, *Cation exchange, *Chromatography, *Density, *Anion exchange, Resins, Volumetric analysis, Separation techniques, Analytical techniques, Water analysis, Waste identification, Water pollution sources, Industrial wastes, Chemical wastes.

A procedure for quantifying cationic surfactants, especially quaternary ammonium bases, in the range of 0.002-1 mg/liter of water or waste water utilizes thin layer chromatography and densitometry. The samples are initially sublated with ethyl acetate-charged air or nitrogen and the residue is dissolved in methanol. The solution is passed through a double-layer ion exchange column bearing upper and lower layers of wide pore resin for anion and cation exchange; the sample separation procedures produces a runoff containing nonionic surfactants which may be measured separately. Quaternary ammonium bases are eluted from the cation exchange resin with methanolic hydrochloric acid, dried, and redissolved in chloroform. The sample is analyzed by chromatography on silica gel plates with a solvent mixture of ethyl acetate, glacial acetic acid, and water. The plates are aerated at room temperature and sprayed with a dilute reagent composed of bismuth(III) nitrate, glacial acetic acid, potassium iodide, and barium chloride. The plates are dried and covered with clean plates and the spots are measured at 525 nm by a densitometer with an integrating recorder. The recovery of cetylpyridiniumbromide (CPBr) in tap and waste water initially containing 0.1 and 2.5 mg CPBr/liter ranged over 98.4-113%. Anionic surfactant concentrations up to 10 mg/liter did not interfere with quantification of the cationic surfactant. (Lisk-FIRL)
W79-01070

DETERMINATION OF THE BICHROMATE OXIDIZABILITY OF SUGAR FACTORY EFFLUENTS (OPREDELENIE BIKHROMATNOY OKISLYAEMOSTI STOCHNYKH VOD SAKHARNOGO ZAVODA),
A. P. Parkhomets, A. I. Sorokin, and E. V. Ivashchenko.
Sakharnaya Promyshlennost, No. 3, p 22-25, March, 1978. 1 fig, 2 tab, 6 ref.

Descriptors: *Sugar crops, *Food processing industry, *Analytical techniques, *Chemical oxygen demand, *Volumetric analysis, Indicators, Chemical reactions, Boiling, Water quality, Pollutant identification, Waste water treatment, Industrial wastes.

A rapid method for the routine measurement of Cod in sugar refinery effluents is described. An 0.5-5.0 ml sample of waste water is first combined with 100 mg of mercury(II) sulfate and 20 ml of 0.4 N chromium sulfate solution. The mixture is boiled for exactly 5 min. The COD is then quantified by titrametric procedures using diphenylamine, 0-phenanthroline, or N-phenylan-thranylic acid as indicators. (Takacs-FIRL)
W79-01074

A BIOASSAY TECHNIQUE TO EVALUATE THE EFFECT OF SECONDARY EFFLUENT ON ALGAL INTERACTIONS IN THE CONNECTICUT RIVER,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 5C.
W79-01089

ELECTRON SPIN RESONANCE ANALYSIS OF SEMIQUINONE FREE RADICALS OF AQUATIC AND SOIL FULVIC AND HUMIC ACIDS,
New Hampshire Univ., Durham. Dept. of Chemistry.
S. A. Wilson, and J. H. Weber.
Analytical Letters, Vol. 10, No. 1, p 75-84, 1977. 2 fig, 1 tab, 12 ref. OWRT A-035-NH(2), 14-31-0001-3829.

Descriptors: *Acidic soils, *Humates, Organic compounds, Water chemistry, Chemical properties, *Podzol soil, Humic acid, Fulvic acid, *New Hampshire, *Oyster River(NH), *Electron spin resonance.

The solid state and aqueous solution electron spin resonance (esr) spectra of Oyster River and Podzol soil fulvic and humic acids were analyzed. Because the aqueous solution esr spectra mimic the behavior of the model compound para-benzosemiquinone, it is concluded in spin concentration at a potential of 0.20 volts (vs. SCE) demonstrates that the semiquinone radicals are at least partially responsible for the reducing capability of humic materials. From the above results a quantitative semiquinone analysis for humic materials was devised.
W79-01133

IMPACT OF THE SCHWARTZWALDER MINE ON THE WATER QUALITY OF RALSTON CREEK, RALSTON RESERVOIR, AND UPPER LONG LAKE.
Environmental Protection Agency, Denver, CO. Technical Investigations Branch.
For primary bibliographic entry see Field 5B.
W79-01207

MONTHLY DETERMINATIONS OF THE CONCENTRATIONS OF SODIUM, POTASSIUM, MAGNESIUM AND CALCIUM IN THE RAIN AND POOLS OF THE SILVER FLOWE NATIONAL NATURE RESERVE.
Hull Univ. (England). Dept. of Biology.
For primary bibliographic entry see Field 2K.
W79-01212

INLAND MANGROVES AND WATER CHEMISTRY, BARBUDA, WEST INDIES,
Cambridge Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 2K.
W79-01215

EFFECTS OF KELTHANE AND TEMPERATURE ON THE RESPIRATION OF CRANGON FRANCISCORUM,
California Univ., Davis. Dept. of Land, Air and Water Resources.
For primary bibliographic entry see Field 5C.
W79-01241

THE EFFECT OF SOME BASIC STATISTICAL AND BIOLOGICAL PRINCIPLES ON WATER POLLUTION CONTROL,
British Columbia Univ., Vancouver. Faculty of Commerce and Business Administration.
For primary bibliographic entry see Field 5G.
W79-01243

METALS FROM URBAN RUNOFF IN DATED *SEDIMENTS OF A VERY SHALLOW ESTUARY*,
California Univ., Irvine. School of Engineering.
E. R. Christensen, J. Scherfig, and M. Koide.
Environmental Science and Technology, Vol. 12, No. 10, p 1168-1173, October 1978. 4 fig, 4 tab, 16 ref.

Descriptors: *Sediments, *Heavy metals, *Estuarines, Trace elements, Chromium, Manganese, Iron, Cobalt, Copper, Zinc, Lead, Sampling, Chemical analysis, Sedimentation, Sedimentation rates, Bays, Coasts, Pollutants, Water pollution, Water pollution sources, Nonpoint water pollution sources.

Pollution sources for Newport Bay, California, are of a nonpoint nature. To assess the heavy metal pollution of sediments in Upper Newport Bay, receiving runoff from a watershed of 376 sq km, a number of sediment cores were dated and analyzed for Cr, Mn, Fe, Co, Cu, Zn, and Pb. The sedimentation rate was determined to be about 1.8 cm/yr by three independent methods: Pb-210 dating of selected cores, correlation between long-term oscillations in rainfall and similar variations vs. depth of grain size and heavy metal content in cores from

tidal flats, and estimation of the settleable solids budget. Vertical profiles of heavy metals in dated sediment cores indicated that Zn and Pb are the only metals of those investigated that show clearly increased levels in the uppermost strata, deposited since about 1955, when urban development in the watershed began. (Sims-ISWS)
W79-01251

ORGANIC COMPOUNDS IN THE DELAWARE RIVER,
Massachusetts Inst. of Tech., Cambridge. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W79-01252

HYDROCARBONS IN THE MARINE ENVIRONMENT OF PORT VALDEX, ALASKA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5B.
W79-01254

ION EXCHANGE MEMBRANE METHODS FOR CONTINUOUS REMOVAL OF IONS FROM WATER AND TRACE CHEMICAL ANALYSIS,
Southern Illinois Univ., Carbondale. Dept. of Chemistry and Biochemistry.
J. A. Cox.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 918, Price codes: A04 in paper copy, A01 in microfiche. University of Illinois of Urbana Champaign, Water Resources Center Research Report No 138, October 1978. 72 p, 13 fig, 10 tab, 2 ref. OWRT A-087-ILL(6).

Descriptors: *Chemical analysis, *Electrochemistry, Eletrodialysis, Ion exchange, Nitrogen compounds, Phosphates, *Pollutant identification, Chemical extraction, Electrodeposition, *Ion selective membranes, *Inorganic trace analysis, Metals-general.

Trace analysis of wastewater and natural water samples generally requires extensive sample pretreatment. Separation of the samples from concentrated receiver electrolytes by ion exchange membranes, which results in Donnan dialysis, provide rapid, precise, and accurate transfers of test ions from the samples into the electrolytes. Optimum receiver electrolytes were described for cations, anions of weak acids, and weakly basic aniona such as nitrate and chloride. The medthods were superior to solvent extraction, columnar ion exchange, and chemical digestions in comparative tests on surfce water and sewage samples. Donnan dialysis was also used as the basis for the design of voltammetric ion selective electrodes. A nitrate electrode was constructed which provideds a 3 order-of-magnitude linear range and a 6 micromolar detection limit. A system for continuous removal of selected ions which used Donnan dialysis followed by electrochemical deactivation was tested. Donnan dialysis was somewhat slower than electrodialysis under comparable conditions. A successful means of continuously reducing nitrate to ammonia was developed, but removal of phosphate based upon planting the ion as a sparingly soluble salt on an electrode failed because of surface passivation.
W79-01327

WATER CHEMISTRY AND THE RELIABILITY OF ELECTRONIC FIELD INSTRUMENTS,
Colorado Univ., Boulder. Dept. of Environmental, Population, and Organismic Biology.
R. W. Pennak.
Limnol Oceanogr. 18(5), p 811-812, 1973.

Descriptors: Colorado, *Dissolved solids, Electronic equipment, Gravimetric instruments, New Mexico, Sewage effluents, Solids, *Water chemistry, Wyoming, Pollutant identification, Instrumentation.

A small portable meter was acquired which, the manufacturer claims, measures dissolved solids anywhere, is simple to operate, and gives instant readings without calculations. A wide variety of 1- to 3-l water samples from lakes and streams in Wyoming, Colorado and New Mexico was used for comparing dissolved solids with readings obtained with the portable field instrument. With only 1 exception, all of the instrument readings were greater than their corresponding gravimetric determinations, some being very much greater. The instrument error ranged from -11.5%--+272.9%, the mean being +102.0%. Artificial seawater gave a reading 20% too high. Obviously this instrument is useless for freshwaters, sewage effluents, salt, or brackish waters. The fundamental difficulty lies with the manufacturer's misunderstanding of the gravimetric ratios of dominant ions in fresh and salt waters. Clarke gives the 'average' percentage composition of river and lake waters of North America as follows: CO3, 33.40; SO4, 15.31, Cl, 7.44; NO3, 1.15; Ca, 19.36; Mg, 4.87; Na, 7.46; K, 1.77; (Fe, Al)2O3, 0.64; SiO2, 8.60. A more reasonable freshwater instrument could probably be devised based on standardization with salt solutions representing these ionic approximations. Similarly, there is need for a separate model for marine and brackish water. Careful local standardization of any electronic device for aquatic work is necessary.--Copyright 1974, Biological Abstracts, Inc.
W79-01333

EVALUATION OF MICROMOLAR COMPLEXIMETRIC TITRATIONS FOR THE DETERMINATION OF THE COMPLEXING CAPACITY OF NATURAL WATERS,
North Carolina, State Univ. at Raleigh. Dept. of Chemistry.
K. W. Hanck, and J. W. Dillard.
Analytic Chimica Acta, Vol 89, p 329-338, 1977. 5 fig, 4 tab, 33 ref. OWRT A-052-NC(3). 14-31-0001-3533.

Descriptors: *Polaragraphic analysis, *Anodic stripping voltammetry, *Analytical techniques, *Trace metals, *Complexing capacity, EDTA, *Volumetric analysis, Metal ions, *North Carolina, *Pollutant identification, Trace elements, *Neuse River(NC).

The titration of micromolar levels of complexing agents with metal ion titrants, and voltammetric methods to locate the equivalence point, have been evaluated experimentally and theoretically. Both anodic stripping voltammetry and differential pulse polarography give systematically low results if labile metal ions are used as titrants. Low-temperature (0C) dual-cell anodic stripping voltammetry greatly minimizes the effects of metal complex lability but the mercury film electrodes deteriorate rapidly because of temperature cycling. A micromolar complexiметric titration with a voltammetric end-point is not a practical method for determining the complexing capacity of natural waters. (Kiger-N Carolina)
W79-01344

DETERMINATION OF THE COMPLEXING CAPACITY OF NATURAL WATER BY COBALT (III) COMPLEXATION,
North Carolina State Univ. at Raleigh. Dept. of Chemistry.
K. W. Hanck, and J. W. Dillard.
Analytical Chemistry, Vol. 49, p 404-409, March 1977. 4 fig, 7 tab, 25 ref. OWRT A-052-NC(4), 14-31-0001-3533.

Descriptors: *Polaragraphic analysis, Anodic stripping voltammetry, *Analytical techniques, *Trace metals, *Complexing capacity, EDTA, *Pollutant identification, Trace elements, *Neuse River(NC), *North Carolina.

The complexing capacity of natural water has been determined by complexation with Co3+. The method eliminates many of the problems of metal complex lability associated with previous procedures. A known excess of Co2+ was added to the sample. The Co(II) complexes formed were oxidized to kinetically inert Co(III) complexes with H2O2. After removing the excess H2O2 with the enzyme catalase, the unreacted Co2+ was determined by differential pulse polarography in 0.06 M ethylenediamine. The detection limit is 0.4 x 10 to the -6th power mol of ligand/l. Magnesium, calcium, sodium, potassium, chloride, sulfate, carbonate, and bicarbonate do not interfere. A semi-automated procedure was developed and applied to a series of natural water samples. (Kiger-N Carolina)
W79-01345

THE EFFECTIVENESS OF SAND FILTERS FOR THE REMOVAL OF SPECIFIC VIRUSES FROM WATER USING SELECTED CATIONS AS FILTER AIDS,
Auburn Univ., AL. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W79-01352

A WATER POLLUTION SURVEY, MAINLY BY BRITISH SCHOOL CHILDREN,
Nature Conservancy, Abbots Ripton (England). Monks Wood Experimental Station.
For primary bibliographic entry see Field 5G.
W79-01354

WATER QUALITY AND CONTROL OF PLANT PATHOGENS IN IRRIGATION REUSE,
Nebraska Univ., Lincoln. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W79-01358

SEASONAL GROWTH AND DECOMPOSITION OF VALLISNERIA AMERICANA IN THE PAMLICO RIVER ESTUARY,
East Carolina Univ., Greenville. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-01362

GEOCHEMISTRY OF MINE EFFLUENTS IN THE FRONT RANGE MINERAL BELT OF COLORADO,
Colorado School of Mines, Golden.
A. J. Ramirez Rojas.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 946, Price codes: A06 in paper copy, A01 in microfiche. MS Thesis (1976). 112 p, 9 fig, 11 tab, 44 ref, 4 append. OWRT A-034-COLO(1), 14-34-0001-7012.

Descriptors: Mineralization, Water quality, *Mine drainage, *Colorado Mineral Belt, *Mine wastes, Chemical analysis, *Water analysis.

Results of the chemical analyses of water draining from 7 mine adits within five mining districts were compared to the ore petrology, ore mineralogy, and type of ore deposit. The water samples were collected in the Front Range Mineral Belt of Colorado in which most of the metal deposits are predominantly a complex mixture of copper, lead, zinc, and silver sulfides, gold tellurides and arsenides. The oxidation of pyrite which is asssocated with these complex ores yields acid water containing high concentrations of iron, sulfate and other trace metals contained in its structure. This acidity promotes the dissolution and oxidation of the other sulfides which release high concentrations of base metals to the water, but no additional acidity. The position and movement of the water table related to the ore veins and the type of ore play an important role in determining changes in the water quality from metal mine drainages. From these results, it was found that all the mine effluents fit the diffuse aquifer system. The Emmett and Clyde Mines are a good example of the type of ore vs. the water quality. In the Emmett Mine the acidity generated from the oxidation of pyrite promotes the solubility of fluoride which releases hydrofluoric acid which attacks the silicate rocks. All these reactions are responsible for the chemistry of the water found in this adit. The Clyde Mine, which shows almost complete absence of sulfide minerals, has the best water quality of all the mine effluents studied. Calculated values for redox potentials using the ferric-ferrous couple and taking into account the ionic strength activity coefficients

and ferric sulfate and fluoride complexes agree very well with the measured Eh values. Conductivity was also found to correlate really well with the total dissolved solids. These results demonstrate the utility of Eh and conductance measurements in acid mine drainages.
W79-01363

DISSOLVED-SOLIDS CONCENTRATIONS OF WATER IN THE NIAGARA AQUIFER, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01369

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 2A: SOUTHERN FLORIDA, SURFACE WATER.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01370

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 2B: SOUTHERN FLORIDA, GROUND WATER.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01371

WATER RESOURCES DATA FOR NEW HAMPSHIRE AND VERMONT, WATER YEAR 1977.
Geological Survey, Boston, MA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01372

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 1: NORTHEAST FLORIDA.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01373

AN AUTOMATED PROCEDURE FOR THE SIMULTANEOUS DETERMINATION OF SPECIFIC CONDUCTANCE AND PH IN NATURAL WATER SAMPLES,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 2K.
W79-01374

CHEMICAL QUALITY OF WATER USED FOR MUNICIPAL SUPPLY IN FLORIDA, 1975,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01375

PROGRAM FOR MONITORING SURFACE-WATER QUALITY IN FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01376

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN MONTANA, OCTOBER 1977 THROUGH SEPTEMBER 1978.
Geological Survey, Helena, MT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01379

WATER-QUALITY INDICES FOR SPECIFIC WATER USES,
Geological Survey, Oklahoma City, OK. Water Resources Div.
For primary bibliographic entry see Field 5G.
W79-01381

DISSOLVED-SOLIDS CONCENTRATIONS AND LOADS IN FLORIDA SURFACE WATERS,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01382

GROUND-WATER RESOURCES AND GEOLOGY OF COLUMBIA COUNTY, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 2F.
W79-01384

SEASONAL VARIATION IN PCO2 AND C-13 CONTENT OF SOIL ATMOSPHERE,
Geological Survey, Idaho Falls, ID. Water Resources Div.
For primary bibliographic entry see Field 2F.
W79-01387

A CHEMICAL BUDGET OF A SOFT-WATER BOG LAKE: BENTHIC CONTRIBUTIONS,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 2H.
W79-01423

LAG ADJUSTMENT BETWEEN ESTIMATED AND ACTUAL PHYSIOLOGICAL RESPONSES CONDUCTED IN FLOW-THROUGH SYSTEMS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W79-01445

A BIOLOGICAL ASSESSMENT OF FISH AND BENTHIC POPULATIONS INHABITING A KRAFT MILL EFFLUENT CHANNEL,
Florida Univ., Gainesville. School of Forest Resources and Conservation.
For primary bibliographic entry see Field 5C.
W79-01448

INFLUENCE OF SEDIMENT IN COPPER TOXICITY TESTS WITH THE POLYCHAETE NEANTHES ARENACEODENTATA,
Environmental Research Lab., Narragansett, RI.
C. E. Pesch, and D. Morgan.
Water Research, Vol. 12, p 747-751, 1978. 2 fig, 4 tab, 12 ref.

Descriptors: *Copper, *Toxicity, *Bioassay, Mortality, *Sediments, Sands, Sea water, Worms, Aquatic animals, Water chemistry, Chemical analysis, Metals, Path of pollutants, *Polychaetes, Neanthes, *Tissue analysis, *Bioaccumulation.

Adult male Neanthes arenaceodentata were exposed to measured concentrations of 0.04, 0.06, 0.10, 0.16, and 0.26 mg l-1 Cu in a continuous-flow bioassay system, with and without a clean sand, to assess the influence of sand on Cu induced mortality. The presence of sand did affect the results. The 28-day LC50 was lower for polychaetes exposed without sand than those with sand. The reasons for this difference are discussed. (EIS-Deal)
W79-01460

WATER QUALITY INVESTIGATION RELATED TO SEAFOOD PROCESSING WASTEWATER DISCHARGES AT DUTCH HARBOR, ALASKA, OCTOBER 1975, OCTOBER 1976,
Environmental Protection Agency, Anchorage, AL. Alaska Operations Office.
For primary bibliographic entry see Field 5C.
W79-01469

ORGANIC CONTAMINANTS,
Environmental Research Lab. Duluth, MN.
For primary bibliographic entry see Field 5C.
W79-01471

CHLORO-ORGANICS IN SURFACE WATER SOURCES FOR POTABLE WATER,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 5B.
W79-01472

THE SLOPE OF GRAN'S PLOT: A USEFUL FUNCTION IN THE EXAMINATION OF PRECIPITATION, THE WATER-SOLUBLE PART OF AIRBORNE PARTICLES, AND LAKE WATER,
Y. Lee, and C. Brosett.
Swedish Water and Air Pollution Research Institute, B 442, June 1978. 30 p, 7 fig, 6 tab, 11 ref.

Descriptors: *Gran's plot, *Volumetric analysis, *Acids, *Precipitation(Atmospheric), *Fallout, *Lakes, *Analytical techniques, Rainfall, Hydrogen ion concentration, Equations, Baltic Sea, Gulf of Bothnia, Kattegat, Sweden, Weak acids, Methodology, Particulates.

An expression derived for the slope of Gran's plot (an acid-base titration procedure) is shown to be useful in determining whether a titrated sample contains weak acids other than those known to exist in the system. The slope of Gran's plot had been observed to vary from case to case due to the presence of weak acids, and the equation was derived to express the relationship between the slope and components contributing to the acid-base equilibrium. The new method was applied to: (1) rainwater samples, (2) leaching solutions of airborne particles, and (3) lake water. In the rainwater and airborne particle samples, it was found that no unknown weak acids were present that could affect pH in the 4-5 range, but use of the method with seven lake water systems clearly indicated the presence of weak acids. Through trial and error it was shown that there was one predominate weak acid with an apparent dissociation constant of about .0003. Its concentration could be calculated, and it was found to be linearly correlated to the color of the samples. In cases with more than one weak acid, analysis may be possible using a generalized least-squares method. Precipitation and particle samples were collected on the Swedish Baltic Sea coast in the Gulf of Bothnia, and lake samples were collected at an inland location near the Kattegat Channel between Sweden and Denmark. (Lynch-Wisconsin)
W79-01474

USE OF UNICELLULAR ALGAE FOR EVALUATION OF POTENTIAL AQUATIC CONTAMINANTS,
California Univ., Irvine.
J. Scherfig, P. Dixon, C. Justice, and R. Appleman.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A041 565, Price codes: A03 in paper copy, A01 in microfiche. Report No. AMRL-TR-76-65, 1976. 24 p, 3 fig, 6 tab, 10 ref. F33615-76-C-55.

Descriptors: *Pollutants, *Selenastrum capricornutum, *Bioassay, *Bioindicators, *Toxicity, *Analytical techniques, Water pollution effects, Jet fuels, Hydrazines, Lubrication additives, Cultures, Continuous culture, Batch culture, Methodology, Algae, Monomethylhydrazine, Stimulation, Environmental effects, Lethal limit, OPAN.

The unicellular alga Selenastrum capricornutum was used in bioassay experiments to determine toxic or stimulatory effects of jet fuels, lubrication additives, and hydrazines on algal growth. Tests were conducted under standard laboratory conditions using standard batch and continuous cultures of S. capricornutum in the presence of bacteria. The Standard Batch Algal Assay appert to be a relatively easy, sensitive, and inexpensive method for evaluating chemicals that enter the aquatic environment. Current research has emphasized de-

velopment of bioassay protocol, photosynthetic methods of assessment, and chemical and algalassessment of hydrazine. Methods and procedures are discussed in detail, including determination of Selenastrum growth rate under batch conditions, hydraZine determination, reagents and apparatus, continuous culture, photosynthesis/respiration (Warburg experiments, dissolved oxygen probe), and Coulter counter procedure. Aeration did not statistically affect the rate of hydrazine decomposition, but the rate increased with increasing concentration of medium. A stratistically significant (> 90%) difference in maximum algal cell volume for 10% SAAM at hydrazine levels of 10, 5, and 0.5 microliter/liter was observed. Effects of OPAN have not been determined. Exposure of algal cells to SDMH at 10 mg/liter resulted in a morphological variant 30-43% smaller than normal cells, but it is uncertain that this was due to the SDMH. (Lynch-Wisconsin)
W79-01476

5B. Sources Of Pollution

MODELING PESTICIDES AND NUTRIENTS ON AGRICULTURAL LANDS,
Hydrocomp, Inc., Palo Alto, CA.
A. S. Donigian, Jr., and N. H. Crawford.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 566, Price codes: A15 in paper copy, A01 in microfiche. Environmental Protection Agency Report No. 600/2-76-043, February, 1976. 332 p.

Descriptors: *Simulation analysis, Runoff, Hydrology, Soil erosion, Nitrogen, Phosphorus, Snowmelt, Watersheds, Pesticides, Return flow, *Nutrients, *Model studies.

Modifications, testing, and further development of the Pesticide Transport and Runoff (PTR) Model have produced the Agricultural Runoff Management (ARM) Model. The ARM Model simulates runoff, snow accumulation and melt, sediment loss, pesticide-soil interactions, and soil nutrients transformations on small agricultural watersheds. The report discusses the major modifications to and differences between the PTR and ARM Models. An energy-balance method of snow simulation, and a first-order transformation approach to nutrient modeling are included. Due to lack of data, the nutrient model was not tested with observed data; testing and refinement are expected to begin in the near furture. Instrumented watersheds in Georgia provided data for testing and refinement of the runoff, sediment and pesticide portions of the ARM Model. Comparison of simulated and recorded values indicated good agreement for runoff and sediment loss, and fair to good agreement for pesticide loss. Pesticides transported only by sediment particles were simulated considerably better than pesticides that move both in solution and on sediment. A sensitivity analysis of the ARM Model parameters demonstrated that soil moisture and infiltration, land surface sediment transport, pesticide-soil interactions, and pesticide degradation are the critical mechanisms in simulating pesticide loss from agricultural watersheds. (Skogerboe-Colorado State)
W79-01004

DISTRIBUTION OF AUTOTROPHIC NITRIFYING BACTERIA IN A POLLUTED RIVER (THE PASSAIC),
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Environmental Science.
V. A. Matulewich, and M. S. Finstein.
Applied and Environmental Microbiology, Vol. 35, No. 1, p 67-71, January 1978. 4 tab, 14 ref. OWRT A-030-NY(5), 14-31-0001-3830.

Descriptors: Stream pollution, *Path of pollutants, *Nitrificaton, *Sediment-water interfaces, Nitrites, Nitrates, Nitrogen benthos, *New Jersey, *Passaic River(NJ), Distribution, *Nitrifying bacteria.

The abundance of nitrifying bacteria, determined by most-probable-number procedures, within habitats of the Passaic River was as follows: rooted aquatic plants > algae approximately or equal to rocks > sediments >> water. On the average, NH4+ oxidizers were 540-fold more abundant in the topmodt 1 cm of sediment than in the water, and NO2 oxidizers were 250-fold more abundant. The population densities in this surface sediment at two nearby stations, one with a predominantly mineral stream bed and the other an organic ooze, did not differ significantly. Large numbers of nitrifiers were present to a depth of about 5 cm in a mineral sediment core. These results show the importance of rooted aquatics and of sedimentary deposits in the nitrification process of polluted streams.
W79-01007

MINE EFFLUENTS IN THE FRONT RANGE MINERAL BELT OF COLORADO,
Colorado School of Mines Golden.
T. R. Wildeman.
Colorado Mining Association 1976 Mining Yearbook, p 54-68. 5 fig, 3 tab, 6 ref. OWRT A-034-COLO(4), 14-34-0001-6006.

Descriptors: *Mine effluents, Water quality, *Mine drainage, *Colorado Mineral Belt, Colorado, Rocky Mountain region, *Colorado Front Range.

Recent studies on the chemistry of water associated with mining activities in Colorado and particularly in the Front Range Mineral Belt, are summarized. Most water of poor quality flows from abandoned mines, and drainage from active operations is not necessarily harmful. Water of poorest quality will be generated where pyrite is a predominant vein mineral. Most mine drainages are recharged by a diffuse flow aquifer system in which the water residence time is on the order of months and the water chemistry shows little response to changes in precipitation and the seasons. Water from a disseminated ore system will generally be of poorer quality than that from a vein ore system. If much of the ore body occurs above the water table, oxidation of the vein minerals is promoted which leads to water of poor quality. Two maintenance rules should yield mine effluents of better quality in active mining operations: (1) keep the contact time of the water with the vein minerals as short as possible, and (2) seal the vein minerals from the air wherever possible.
W79-01008

DISTRIBUTION OF TRACE METALS AND SEDIMENTS IN ESTUARIES OF THE KUM RIVER AND THE MANKYUNG RIVER,
Seoul National Univ. (Republic of Korea). Dept. of Oceanography.
K. W. Yearn, and Y. A. Park.
The Journal of the Oceanographical Society of Korea, Vol. 13, No. 1, p 19-28, 1978. 12 fig, 2 tab, 20 ref.

Descriptors: *Iron, *Zinc, *Manganese, Chemical analysis, Metals, Path of pollutants, Bottom sediments, Leaching, Salinity, Suspended solids, Suspended load, Sediment load, Sediment transport, Particle size, Estuaries, Silts, Clays, *Korea, *Kum River(Kor), *Mankyung River(Kor).

To estimate the chemical mass balance of several kinds of trace metals in sea water, suspended matter and bottom sediments, sixty samples from the Kum and Mankyung estuaries (Korea) were analyzed. In both estuaries, the distribution patterns of leachable suspended trace metals and of bottom sediments were established to be similar. The relationship between the metal concentration and clay content of the sediments was found to be such that the metal concentration increased with an increase in clay content. A linear correlation was determined between the pairs of leachable metals (Fe-Zn, Fe-Mn and Zn-Mn) in the Kum estuary. However, in the Mankyung estuary linear relationship does not exist. Finally, it is suggested that the trace metals are reworking in the Kum estuary and those in the Mankyung estuary are sinking. (EIS-Katz)
W79-01014

POLLUTION STUDIES OF RIVER KHAN (INDORE) INDIA -- I. BIOLOGICAL ASSESSMENT OF POLLUTION,
Vikram Univ., Ujjain (India). School of Studies in Botany.
For primary bibliographic entry see Field 5A.
W79-01018

UPTAKE AND RELEASE OF PETROLEUM BY INTERTIDAL SEDIMENTS AT PORT VALDEZ, ALASKA,
Alaska Univ., Fairbanks. Inst. of Marine Science.
D. G. Shaw, L. M. Check, and A. J. Paul.
Estuarine and Coastal Marine Science, Vol. 5, p 429-436, 1977. 1 tab, 2 fig, 18 ref.

Descriptors: *Adsorption, *Intertidal areas, *Oil spills, *Pollutant identification, *Biodegradation, On-site investigations, Tidal effects, Gas chromatography, Sediments, Water pollution effects, Path of pollutants, Organic compounds, *Alaska, *Port Valdez(Alas).

The uptake and release of Prudhoe Bay crude oil by intertidal sediments at Port Valdez, Alaska, have been studied. In two experiments designed to simulate the stranding of a light oil slick, oil was spread on sediments daily for 5 days. Hydrocarbon content of the top 1.0cm of the sediments was monitored for 60 days from the first oiling. The two experimental rates of oil application were 1.2 microliters per square cm and 5.0 microliters per square cm. In both experiments the added oil was no longer detectable on the sixtieth day. Possible reasons for this rapid loss of petroleum by sediments are discussed. (EIS-Katz)
W79-01022

CHLORINATED HYDROCARBONS IN MARINE INSECTS,
Scripps Inst. of Oceanography, La Jolla, CA.
L. Cheng, and T. F. Bidleman.
Estuarine and Coastal Marine Science, Vol 5, p 289-291, 1977. 1 tab, 9 ref.

Descriptors: *Aquatic insects, *Pesticide residues, *DDT, *Path of pollutants, *Food webs, *Polychlorinated biphenyls, Chlorinated hydrocarbon pesticides, Pesticides, Insects, Invertebrates, On-site investigations, *Halobates, Fucellia, Rheumatobates, *Bioaccumulation, *Marine insects.

Total DDT concentations in the oceanic Halobates were found to be 5-10 times higher (180-400 ng/g dry wt.) than those of the related nearshore Rheumatobates (less than 50 ng/g) or of the comon beach fly Fucellia (18 ng/g). This difference could perhaps be explained by the different diets of these three marine insects; Halobates being a predator of zooplankton, while Rheumatobates feeds on phytophagous insects and fucellia feeds on more or less decomposing seaweeds. The PCB concentrations (110-300 ng/g) were about the same in the two-sea-skaters, but slightly lower in the beach fly (62 ng/g). (EIS - Katz)
W79-01023

TOTAL MERCURY AND METHYL MERCURY CONTENTS IN FISH FROM LAKE PAIJANNE,
Jyvaskyla Univ. (Finland). Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W79-01028

PARAMETERIZATION OF SULFATE REMOVAL BY PRECIPITATION,
Battelle Pacific Northwest Labs., Richland, WA.
B. C. Scott.
Journal of Applied Meteorology, Vol. 17, No. 9, p 1375-1389, September 1978. 4 fig, 1 tab, 39 ref, 4 append. Dep. Energy EY-76-C-06-1830.

Descriptors: *Sulfates, *Precipitation(Atmospheric), *Fallout, Rainfall, Snowfall, Sulfur compounds, Sulfur, Water chemistry, Chemistry of precipitation, Clouds, Cloud physics, Water pollution, Water pollution sources, Weather, Meteorology, Sulfate removal, Washout.

The concentration of sulfate in precipitation was predicted to be directly proportional to the sulfate concentration of the air ingested into the cloud, and inversely proportional to cloud water concentration. In addition, for light to moderate precipitation rates, the removal of airborne sulfate by precipitation was forecast to be strongly dependent upon the mechanism of precipitation formation. If the precipitation is in the form of snow or originated as snow in the upper portions of the clouds, then the surface sulfate concentration of precipitation is proportional to R to the (-0.3) power, where R is the precipitation rate. Should the precipitation form without the benefit of an initial ice growth stage, then the sulfate concentrations in precipitation water can increase by a factor of 2 to 10 or more over the ice-dependent predictions. Limited surface observations gave support to these predictions. The analyses leading to the prediction of washout ratios also were used to forecast the mean oxidation rate of SO2. In order to replace the SO4 removed from the atmosphere by each precipitation event, SO2 is required to oxidize at an average rate (over several days) of 0.2-2.0% per hour. (Sims-ISWS)
W79-01038

DISSOLVED MERCURY IN THE LAKE WINDERMERE CATCHMENT AREA,
Liverpool Univ. (England). Dept. of Oceanography.
D. Gardner.
Water Research, Vol. 12, No. 8, p 573-575, 1978. 1 fig, 16 ref.

Descriptors: *Mercury, *Rivers, *Sampling, Surveys, Chemical analysis, Chemicals, Freshwater, Lakes, Geology, Trace elements, Heavy metals, Water quality, *England, *Lake Windermere, Dissolved mercury concentrations.

Typical dissolved mercury (Hg) concentrations in unpolluted waters are alleged to be less than 50 ng/l and sometimes less than 10 ng/l. Mean concentrations found in the catchment area of Lake Windermere were found to range between 12 and 29 ng/l over a three month period. However, in particular instances, concentrations of 75 and 96 ng/l were found, and were thought to be due to runoff from mineral deposits and sewage outfalls respectively. (Sims-ISWS)
W79-01040

GULL DROPPINGS AND THEIR EFFECTS ON WATER QUALITY,
Water Pollution Research Lab., Stevenage (England).
D. J. Gould, and M. R. Fletcher.
Water Research, Vol. 12, No. 9, p 665-672, 1978. 2 fig, 7 tab, 31 ref.

Descriptors: *Gulls, *Birds, *Animal wastes(Wildlife), *Water quality, *Bacteria, Laboratory tests, Coliforms, Streptococcus, Clostridium, Salmonella, Nutrients, Nitrogen, Phosphorus, Water pollution, Water pollution sources, Water birds, Analytical techniques, Bioindicators, Biology, Gull droppings.

Droppings collected over periods of 24 h, from four species of captive gulls of the genus Larus, were examined for total coliforms, fecal coliforms, fecal streptococci and Clostridium perfringens. Samples also were monitored for salmonella, and representative groups of samples were analyzed for nutrient content. The occurrence of several types of droppings, characterized by their color and consistency, was recorded. Daily loads of coliform bacteria indicated that the outputs of the two larger species of gull approximated to values quoted for man; values for other indicator bacteria, however, were considerably lower in all gull species. Salmonella were not detected. Daily loads of Kjeldahl nitrogen from each bird varied from 608 to 1,819 mg, and total phosphorus from 3 to more than 115 mg, according to species. (Sims-ISWS)
W79-01041

TRACE METAL ENHANCEMENT IN THE BIOTIC AND ABIOTIC COMPONENTS OF AN ESTUARINE TIDAL FRONT,
Delaware Univ., Lewes. Marine Studies Complex.
L. V. Sick, C. C. Johnson, and R. Engel.
Journal of Geophysical Research, Vol. 83, No. C9, p 4659-4667, September 20, 1978. 5 fig, 3 tab, 35 ref.

Descriptors: *Trace elements, *Metals, *Estuaries, *Marine biology, On-site investigations, Tidal waters, Zooplankton, Dissolved solids, Suspended solids, Chlorophyll, Density, Temperature, Water temperature, Salinity, Secchi disks, Turbidity, Sampling, *Delaware Bay, Fronts(Oceanic), Tidal fronts.

A frontal system of lower Delaware Bay was investigated to illustrate the role that such tidal fronts can have in concentrating trace metals and serving as a means for introducing trace metals into the trophic hierarchy of estuaries. This frontal system typically develops on ebb tide and can extend at least 32 km parallel to the central axis of Delaware Bay. In relation to samples collected on either side of the front, chlorophyll a concentrations and concentrations of selected trace metals in zooplankton, particulates, and the dissolved fraction were significantly higher in samples collected at the front. Seasonally, concentrations of cadmium and copper in all fractions were highest during the summer or fall. Differences in taxonomic composition of zooplankton assemblages, as well as differences in total numbers of organisms across the front, suggest advective transport by convergent water masses. (Sims-ISWS)
W79-01046

LABORATORY INVESTIGATION OF WATER POLLUTION BY ORGANIC SUBSTANCES IN FLAX WASTES DELIGNIFICATION (LABORATORNE SLEDOVANIE ORGANICKEHO ZNECISTENIA VOD PRI DELIGNIFIKACII LANOVYCH ODPADOV),
Vyskumny Ustav Papieru a Celulozy, Bratislava (Czechoslovakia).
T. Halmova, and L. Balhar.
Papir a Celuloza, Vol. 33, No. 5, p 33-38, 1978. 10 fig, 7 tab, 5 ref.

Descriptors: *Pulp wastes, *Pulp and paper industry, *Lignins, *Bleaching wastes, *Alkalis(Bases), Organic wates, Chemical oxygen demand, Biochemical oxygen demand, Waste water treatment, Industrial wastes.

The organic composition of spect liquors from delignification of raw flax wastes was evaluated in a kraft pulping operation for the production of cigarette papers. Three grades of laboratory processed flax raw material with lignin concentrations of 8.9-15.7% were employed; the raw flax wastes contained 91.42-92.71% solids and 2.00-3.62% ash. The solids, ash, annealing residue, BOD, and COD content of the spect liquors and bleaching effluents were measured. The lignin concentration and other parameters of the raw material were also reported. The lignin concentration and other parameters of the raw material were also reported. The quantity of alkali added during the pulping process and the grade of flax raw material directly influenced the organic quality of the spent liquors. When the alkali addition was held constant, the length of the pulping time did not affect the organic content of the liquors. (Lisk-FIRL)
W79-01085

CHARACTERISTICS OF INCINERATOR RESIDUE AND THE EFFECT OF ITS LEACHATE ON GROUNDWATER QUALITY,
Connecticut Univ. Storrs. Inst. of Water Resources.
K. A. Healy, H. E. Klei, and D. W. Sundstrom.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 641, Price codes: A02 in paper copy, A01 in microfiche. Completion Report, 1978. 15 p, 5 fig. 2 tab. OWRT A-067-CONN(2), 14-31-0001-6007.

Descriptors: *Incineration, *Leachate, *Groundwater, Waste disposal, Hydraulic properties, Mechanical properties, Municipal waste, Landfills, *Incinerator residue, *Municipal sewage sludge incinerator ash, Leaching characteristics, Sanitary landfills, Lysimeter studies, pH variation, Batch studies.

This project has determined the hydraulic and mechanical characteristics of incinerator residue from solid wastes and from sewage sludge. Large samples of incinerator residue were obtained from several incinerator plants in Connecticut and brought to the soil mechanics laboratory at the University of Connecticut for testing. The hydraulic permeability and strength of compacted incinerator residue were measured. Qualitative and quantitative leaching characteristics of unquenched municipal sewage sludge incinerator ash were studied with respect to amount of water applied and pH variation. Chemical digestion by wet decomposition of unquenched ash showed high residual concentrations of magnesium, sodium, calcium and potassium. Iron was contained in the highest residual concentration of all heavy metals monitored, with zinc second and chromium, coabalt, copper, manganese, nickel and lead present in lower concentrations. Batch ad lysimeter studies were used to examine the eluting of the above cations out of the ash and into the water. In addition sulfur, nitrate and chloride were monitored with sulfate having the highest concentrations. Lysimeter effluent analysis revealed basically similar types of 'inmmediate washing out' curves for both cations and anions with the exception of calcium, which remained in relatively higher concentrations for a longer period of time before its concentration declined. (Scottrans-Conn)
W79-01090

SEDIMENTATION AND MICROBIAL METABOLISM IN A SHALLOW ESTUARY,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 2J.
W79-01091

OXIDATION-REDUCTION CHEMISTRY AND AQUEOUS AMMONIUM OXIDATION IN THE ESTIMATION OF NITRATE BY THE CADMIUM REDUCTION METHOD,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Chemical and Biochemical Engineering.
B. Sharma, R. C. Ahlert, and J. Saldick.
J. Environ. Sci. Health - ENVIRON. SCI. ENG., A11(3), p 255-279, 1976. OWRT A-037-NJ(1), 14-31-0001-5030.

Descriptors: *Cadmium, *Ammonia, *Nitrates, Nitrates, *Ammonium oxidation, Cadmium reduction, Nitrate ion.

Experimental and thermodynamic evidence is presented to show that nitrate-N can be reduced beyond nitrite-N in a cadmium reductor. The studies are made in a batch system and include the effect of sample to reductor ratio. Data presented show that aqueous ammonium-N can be oxidized in nitrite-N at a rate of about 0.1 - 0.04 percent per day in the presence of air and cadmium-copper or cadmium-mercury complex. The rate of this oxidation, unaffected by absence of light, is reduced to the order of 0.001 percent per day or less in a nitrogen atmosphere and cadmium-mercury complex. Hence a requirement for air is suggested for the oxidation reaction.
W79-01100

THE IMPACT OF HAZARDOUS WASTES ON GROUND WATER: PART II,
National Water Well Association, Worthington, OH.
T. E. Gass.
Water Well Journal, Vol. 30, No. 11, p 30-31, November, 1978.

Descriptors: *Hazards, *Water pollution, *Waste disposal, Solid wastes, Sludge disposal, Accidents,

Waste disposal wells, Injection wells, Regulations, Groundwater.

Indiscriminate disposal of hazardous chemical wastes often leads to ground-water contamination. Land spreading as a method of sludge disposal warrants caution since sludge may contain organic and inorganic chemicals and viruses which may harm ground water. Accidental spills of toxic materials are becoming more common due to lack of controls on the transportation of hazardous materials. There is a need for more effective clear-up methods. Improved design and detailed hydrogeologic evaluations have made modern injection wells more safe. However, the threat of ground water pollution is still present due to the high solubility of toxic chemicals and the slow rate of ground water flow. Hazardous materials can be properly stored, transported and disposed if state and federal governments develop adequate regulations. In addition, there should be mandatory comprehensive monitoring of storage and disposal facilities and more frequent and detailed analysis of water sources susceptible to contamination. (Purdin-NWWA)
W79-01113

CADMIUM AVAILABILITY TO RICE IN SLUDGE-AMENDED SOIL UNDER 'FLOOD' AND 'NONFLOOD' CULTURE,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5E.
W79-01127

A NONSTRUCTURAL APPROACH TO CONTROL SALT ACCUMULATION IN GROUND WATER,
California Univ., Davis. Dept. of Civil Engineering.
O. J. Helweg.
Ground Water, Vol. 15, No. 1, January-February 1977. 6 p, 9 fig, 6 ref. (California Water Resources Center Project UCAL-WRC-W-517). OWRT A-060-CAL(1).

Descriptors: *Groundwater, *Irrigation practices, Saline deposits, Water quality, Path of pollutants, Agricultural runoff, Stream-aquifer systems.

One of the more subtle and dangerous areas of pollution is that occurring in ground water from normal irrigation practices. The pollution from salt buildup is presently one of the unsolved problems in managing stream-aquifer systems. Several strategies that offer a possibility of controlling this salt buildup are described. For example, instead of applying irrigation ground water near the site of the well, the ASTRAN Method transfers it downstream to be applied on land where the ground water is a lower quality thereby controlling the increase in salt concentration. Instead of preventing seepage loss in delivery canals, the percolating water is used to maintain ground-water quality. Finally, timed releases of return flow remove salts without exceeding surface-water quality constraints. (Snyder-Calif, Davis)
W79-01132

URBAN RUNOFF POLLUTION AND WATER QUALITY PLANNING,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
W. Whipple, Jr.
In: Urban Runoff Quality - Measurement and Analysis, Urban Water Resources Research Council, ASCE Preprint 3091, San Francisco, CA, Oct. 17-21-1977, p 35-59, 7 fig, 1 tab. OWRT A-046-NJ(1), 14-34-0001-8032.

Descriptors: *Biochemical oxygen demand, *Organic matter, *Water quality, *Water resources, *Planning, *Heavy metals, Water pollution, *Urban runoff.

Areawide water quality planning under Section 208 of P.L. 92-500 (The Pollution Control Amendments of 1972) is intended to provide an integration of approach between the effluent treatment standards prescribed by other sections of the act, and the requirement that in obtaining prescribed water quality criteria consideration be given to nonpoint sources of pollution as well as point sources. The lack of a prior data base and of adequate technology for analyzing pollution from these diverse sources has created some difficult problems in carrying out this planning. The report gives characteristics of urban runoff including BOD, phosphates, heavy metals and hydrocarbons, and explains problems of data gathering and analysis. Much of the work done so far in 208 planning can be regarded only as tentative, and additional funds and new procedures will be required for its completion. Among measures to be considered are combined-purpose detention storage to be applied to future new developments, a monitoring and surveillance program to detect illegal waste disposal practices, and measures for proper disposal of waste crankcase oil. Measures for control of general erosion should be encouraged. Control of eutrophication processes, protection of aquifers and proper direction of land use planning are usually essential parts of such plans.
W79-01134

ON THE MECHANISMS OF CO2 AND CH4 PRODUCTION IN NATURAL ANAEROBIC ENVIRONMENTS,
Indiana Univ. at Bloomington. Dept. of Chemistry; Indiana Univ. at Bloomington. Dept. of Geology; and Indiana Univ. at Bloomington. Water Resources Research Center.
For primary bibliographic entry see Field 5C.
W79-01135

DRIFT VELOCITY OF SURFACE FILMS OVER WAVES,
Connecticut Univ., Storrs. Dept. of Civil Engineering.
J. D. Lin, M. C. Mohr, and G. S. Campbell.
In: Proceedings 17th Congress of the International Association for Hydraulic Research, p 173-179. 1977, 4 fig, 13 ref. OWRT A-059-CONN(3), 14-31-0001-5007.

Descriptors: *Oil spills, *Flow measurement, *Oil-water interfaces, *Waves(Water), *Wind velocity, Water pollution sources, Water pollution control, *Surface films, *Drift velocity, *Oil slick spreading, *Wind-generated waves, *Mechanically generated waves, Laboratory wind-wave channel, Polyethelene sheets, Wave steepness.

Drift velocity of surface films floating on the water surface under the action of wind-generated waves and mechanically generated waves respectively has been investigated in a laboratory wind-wave channel by using polyethelene sheets. In order to simulate the drift of oil slicks in a laboratory channel, the size of the film should be greater than two wavelengths for wind-waves and one wavelength for mechanically generated waves. Drift velocity over wind-generated waves is a function of wind velocity and wave steepness. However, the ratio of drift velocity to shear velocity of the air boundary layer correlates uniquely with wave steepness and becomes independent of wave steepness for sufficiently large wave steepness. For mechanically generated waves, film drift velocity is substantially greater than the surface particle drift of the Stokes waves. In comparison of the drift velocities in a wave field characterized by wave steepness, the effect of wind on drift velocity of surface films predominates in general over that due to waves.
W79-01139

ROLE OF TURBULENT MIXING IN THE DISPERSION OF POLLUTANTS AT THE EDGE OF A LARGE LAKE,
Wisconsin Univ., Madison. Dept. of Meteorology.
For primary bibliographic entry see Field 5C.
W79-01199

IMPACT OF THE SCHWARTZWALDER MINE ON THE WATER QUALITY OF RALSTON CREEK, RALSTON RESERVOIR, AND UPPER LONG LAKE.
Environmental Protection Agency, Denver, CO. Technical Investigations Branch.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 604, Price codes: A03 in paper copy, A01 in microfiche. Report No. SA/TIB-25, March 1972. 40 p, 3 fig, 6 tab, 4 append.

Descriptors: *Water pollution, *Industrial wastes, *Radioactive wastes, *Uranium, *Mine wastes, Sampling, Reservoirs, Radium, Colorado, Sediments, Water quality, Pollution(Stream), Monitoring, On-site investigations, Water quality control, Chemical analysis, Radioactivity, Environmental control.

Water quality of Ralston Creek in the vicinity of the Schwartzwalder uranium mine north of Golden, Colorado, was monitored as a supplement to State/Water Board programs. Emphasis was placed on eliminating data voids, such as radioactivity concentrations in the waters of Ralston Reservoir and Upper Long Lake. Sample collection also included mine effluents, water and bottom sediments from Ralston Creek and Long Lake ditch, and bottom sediment from these sources. A monitoring program was recommended to insure complete and thorough surveillance of these water supply sources. The basic objective was defined as eliminating release of radioactivity-bearing solids (ore fines) to Ralston Creek and maintaining dissolved concentrations of radium-226 and uranium in the creek as far as practicable below 1.0 pCi/L and 1.0 mg/L, respectively. To maintain a suitable environment for development of a diverse aquatic population, levels below 500 micro g/L may be necessary. (Majtenyi-IPA)
W79-01207

WASTE SOURCE INVESTIGATIONS, KINGSPORT, TENNESSEE.
National Field Investigations Center-Denver, CO.; and Environmental Protection Agency, Atlanta, GA. Region IV.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 321, Price codes: A13 in paper copy, A01 in microfiche. EPA Report No. 330/2-73-004, April 1973. 257 p, 14 fig, 42 tab, 8 ref, 7 append.

Descriptors: *Water pollution, *Water pollution sources, *Industrial wastes, *Monitoring, Municipal wastes, Effluents, Biochemical oxygen demand(BOD), Total organic carbon, Kjeldahl nitrogen, Water quality standards, Pollutants, Tennessee, Holston River, Evaluations, Water pollution control, Heated water, Heavy metals, Pulp wastes, Toxicity.

A stream survey was conducted on the South Fork of the Holston River and on the Holston River in and near Kingsport, Tennessee to determine the effects of municipal and industrial waste disposal on river water quality. This was a followup investigation to studies done in 1969 and 1972 and involved measurements of biochemical oxygen demand, total organic carbon, total kjeldahl nitrogen, and nitrite + nitrate nitrogen. Pollution studies focused on discharges from the Kingsport municipal wastewater treatment plant and seven industrial firms: Tennessee Eastman Company, Holston Army Ammunition Plant, Mead Papers, Holliston Mills, ASG Industries, Inc., Penn-Dixie Cement Corporation, and J. P. Stevens. The wasteloads of various pollutants are reported for each of the point sources and recommendations are given for improving water quality to meet State and local effluent standards. Appendices provide details of the sampling procedures and sample stations, methods of analysis, and bioassay methods, as well as tabulations and detailed discussion of the waste sources. (Majtenyi-IPA)
W79-01208

EVALUATION OF THE IMPACT OF THE MINES DEVELOPMENT, INCORPORATED MILL ON WATER QUALITY CONDITIONS IN THE CHEYENNE RIVER.
Environmental Protection Agency, Denver, CO. Region VIII.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 270, Price codes: A04 in paper copy, A01 in microfiche. September 1971. 51 p, 2 fig, 10 tab.

Descriptors: *Water pollution, *Radioactive wastes, *Industrial wastes, *Seepage, *Mine wastes, Mine drainage, Water pollution sources, Cheyenne River, Edgemont, South Dakota, Uranium, Radium, Molybdenum, Water quality, Flow rates, Chemical analysis, Reservoirs, Standing waters, Sampling, On-site investigations, Radiochemical analysis.

The water quality of the Cheyenne River and its tributary, Cottonwood Creek, located near the Mines Development Mill in Edgemont, South Dakota, was studied to determine the general water conditions during dry weather and also the chemical and radioactive pollutants contributed by seepage from mill ponds. During the study period, flows in Cottonwood Creek averaged 0.1 cfs upstream to 0.5 cfs at the mouth and flows in the Cheyenne River ran from 5 cfs upstream to about 132 cfs further downstream with most of this contributed by another tributary. Analysis revealed that seepage from mill ponds raised uranium concentration in Cottonwood Creek to ten times the natural level; however, there was negligible concentration increase in the Cheyenne River because of the greater dilution capacity. Studies on the radium concentration were not fully consistent with the findings for uranium but difficulties with the analytical technique may account for this discrepancy. Visual inspection of pooled areas in the creek revealed a yellowish green color similar to that of water samples obtained from seepage areas. Detection of high concentrations of molybdenum, which is a mill byproduct, further corroborate the source of the seepage contamination. It was concluded that seepage from ponds is continuing despite the fact that the pond is an inactive repository for uranium and sand tailings. A check on the water in the Angostura Reservoir showed that uranium concentrations were at natural background levels with no difference between surface and bottom samples. (Majtenyi-IPA)
W79-01209

THE ECOTONE BETWEEN SPARTINA FOLIOSA TRIN. AND SALICORNIA SALICORNIA VIRGINICA L. IN SALT MARSHES OF NORTHERN SAN FRANCISCO BAY, I. BIOMASS AND PRODUCTION,
California Univ., Berkeley. Dept. of Botany.
For primary bibliographic entry see Field 2L.
W79-01217

THE ECOTONE BETWEEN SPARTINA FOLIOSA TRIN. AND SALICORNIA VIRGINICA L. IN SALT MARSHES OF NORTHERN SAN FRANCISCO BAY: II. SOIL WATER AND SALINITY,
California Univ., Berkeley. Dept. of Botany.
For primary bibliographic entry see Field 2L.
W79-01218

SALT PICKUP BY OVERLAND FLOW IN THE PRICE RIVER BASIN, UTAH,
Colorado State Univ., Fort Collins. Dept. of Earth Resources.
S. L. Ponce, and R. H. Hawkins.
Water Resources Bulletin, Vol. 14, No. 5, p 1187-1200, October 1978. 5 fig, 2 tab, 10 ref.

Descriptors: *Utah, *Salinity, *Overland flow, *Colorado River Basin, *Shales, Irrigation, On-site investigations, Specific conductivity, Rainfall, Runoff, Water pollution sources, Model studies, *Price River Basin(Utah), *Mancos shale, *Nonpoint source loading function, Microwatershed.

This study emphasized a field investigation of salt release to overland flow from Mancos shale lands of the Price River Basin, Utah. Although a high degree of natural variation existed in the data, precluded the separation of factors affecting diffuse salt loading that occurs during overland flow, a simplistic nonpoint source loading function developed on empirical concepts was fit to the data. This function then was used to calculate the average annual salt yield on the Price River by overland flow. It was found that even under severe conditions, the salt yields from Mancos shale lands due to overland flow are relatively minor, accounting for less than 1.5% of the average annual salt mass transported from the basin by the Price River. (Visocky-ISWS)
W79-01245

GEOCHEMISTRY OF MERCURY IN PALOS VERDES SEDIMENTS,
Southern California Coastal Water Research Project, El Segundo, California.
R. P. Eganhouse, D. R. Young, and J. N. Johnson.
Environmental Science and Technology, Vol. 12, No. 10. p 1151-1157, October 1978. 6 fig, 4 tab, 28 ref.

Descriptors: *Mercury, *Sediments, *Outfall sewers, *California, *Pacific Ocean, Sampling, On-site investigations, Chemicals, Chemical analysis, Sewage, Heavy metals, Leaching, Pollutants, Path of pollutants, Water pollution, Coasts, Oceans, *Palo Verdes(Calif).

Sediments affected by a major submarine wastewater outfall on the Palos Verdes shelf analyzed for total mercury and organic mercury. In addition, chemical leaching studies were performed to determine the phase partitioning of mercury in these sediments. A statistically significant decline in surface sediment concentrations of total mercury during 1972-1975 may be due to several factors, including the reduced emission of wastewater solids. Organic mercury levels up to 21.3 micro g/dry kg and 2% of the total mercury were found in sediments near the outfalls; however, the sulfide-rich sediments in the immediate vicinity of the outfalls contained low or undetectable levels of organic mercury. Most of the mercury in these sediments is fixed in a refractory phase, although organic-associated mercury increases in prominence away from the outfalls. In the most-contaminated sediments, mercury appears to be accumulating in this refractory phase and, hence, is largely unavailable for introduction into the tissues of local marine life. (Sims-ISWS)
W79-01250

ORGANIC COMPOUNDS IN THE DELAWARE RIVER,
Massachusetts Inst. of Tech., Cambridge. Dept. of Chemical Engineering.
L. S. Sheldon, and R. A. Hites.
Environmental Science and Technology, Vol. 12, No. 10, p 1188-1194, October 1978. 6 fig, 1 tab, 27 ref. NSF ENV75-13069.

Descriptors: *Water pollution, *Organic compounds, *Rivers, *Pennsylvania, *New Jersey, *Delaware River, Water pollution sources, Pollutants, Path of pollutants, Chemicals, Chemical analysis, Chemical wastes, Water chemistry, Chlorophyll, Algae, Industrial wastes, Sediments, Waste water(Pollution), Potable water, Water treatment.

Nearly 100 compounds were identified in Delaware River water samples taken in August 1976 and March 1977 between Marcus Hook, Pennsylvania, and Trenton, New Jersey. Extractions with Ch2Cl2, liquid chromatographic cleanup and gas chromatographic mass spectrometry were used for compound separation and identification. The observed compounds included natural products, municipal wastes, and industrial contaminantes. The latter were of 3 types: those found in industrialized urban areas with no particular production source, such as aromatic hydrocarbons and phenols; those commonly used in manufacturing processes, such as plasticizers and industrial solvents; and those specific to a single source and traceable to that source, such as a series of chlorinated aliphatic and aromatic polyethylene glycols which were specific to a plant in the Philadelphia area. (Sims-ISWS)
W79-01252

ACCUMULATION OF ARSENIC IN SEDIMENTS OF LAKES TREATED WITH SODIUM ARSENITE,
Texas Univ. at Dallas, Richardson. Inst. of Environmental Sciences.
S. Kobayashi, and G. F. Lee.
Environmental Science and Technology, Vol. 12, No. 10, p 1195-1200, October 1978. 3 fig, 6 tab, 22 ref.

Descriptors: *Lake sediments, *Arsenic compounds, *Sodium arsenite, *Lakes, *Sediments, *Wisconsin, Sampling, Coves, On-site data collections, Laboratory tests, Chemical analysis, Calcium, Manganese, Iron, Phosphorus, Carbon, Chemicals, Surveys, Pollutants, Water pollution.

Sodium arsenite, an aquatic herbicide, has been used extensively in Wisconsin lakes for the control of excessive macrophyte growths. Sediments in several of these treated lakes were investigated for patterns of arsenic accumulation with depth and for relationships to iron, manganese, calcium, and organic carbon content. All sediments had substantial accumulations of arsenic, but no predominant correlation was found with other measured components. In these surficial sediments, arsenic appears to be in a nonoccluded form, with highly organic sediments being more readily leached of arsenic than highly calcareous sediments. (Sims-ISWS)
W79-01253

HYDROCARBONS IN THE MARINE ENVIRONMENT OF PORT VALDEX, ALASKA,
Alaska Univ., College. Inst. of Marine Science.
D. G. Shaw, and B. A. Baker.
Environmental Science and Technology, Vol. 12, No. 10 p 1200-1205, October 1978. 1 fig, 5 tab, 19 ref.

Descriptors: *Organic compounds, Harbors, *Alaska, Sampling, On-site investigations, Bays, Oil, Biota, Water, Sediments, Chemicals, Chemical analysis, Oil spills, Pollutants, Path of pollutants, Water pollution, Water pollution sources, *Port Valdez(Alaska).

Saturated and unsaturated hydrocarbons were determined quantitatively in biota, water, and sediments of Port Valdez, Alaska. The analyses showed the kinds and amounts of hydrocarbons typical of unpolluted nearshore marine environments. Common, prominent compounds include pristane, heptadecane, odd chain length normal alkanes with 21-31 carbon atoms, and a triterpene tentatively identified as squalene. Environmental samples for this work were collected during the period of approximately one year prior to the completion of the trans-Alaska oil pipeline. The operation of a tanker loading facility associated with that pipeline at Valdez will result in a controlled input of petroleum into Port Valdez. The results presented here provide a basis from which to investigate the fate of that added oil. (Sims-ISWS)
W79-01254

EFFECT OF ACID MINE DRAINAGE ON THE PH OF LAKE TOYA, JAPAN,
Toyama Univ. (Japan). Faculty of Science.
K. Goto, T. Tanemura, and S. Kawamura.
Water Research, Vol. 12, No. 9, p 735-740, 1978. 3 fig, 9 tab, 7 ref.

Descriptors: *Acid mine water, *Mine drainage, *Hydrogen ion concentration, *Water pollution, Water pollution sources, Mine wastes, Mine acids, Sulphur, Mining, On-site investigations, Surveys, Lakes, Streams, Alkalinity, Powerplants, Model studies, Mathematical models, Foreign countries, Foreign research, *Japan, *Lake Toya(Japan), Sulphur mines, Mine flooding.

The effect of acid mine drainage on the change of lake water pH was discussed in terms of acid-base balance between the incoming acid and the alkalinity present in the lake water. Comparisons were made between the pH values observed in the past and those calculated from a few assumptions made

about the initial alkalinity of the lake water and the rate of acid supply to the lake. The results explained the reason why the pH of Lake Toya did not drop appreciably until recently, in spite of continued introduction of acid mine drainage. The more recent sharp drop in lake water pH was attributed to the exhaustion of the alkalinity by continued discharge of acid water to the lake. The effectiveness of mine flooding in reducing acid discharge from abandoned sulphur mines also was discussed. (Sims-ISWS)
W79-01258

THE IMPORTANCE OF WATER FOR THE SPREAD OF POTENTIALLY PATHOGENIC MYCOBACTERIA: II. GROWTH OF MYCOBACTERIA IN WATER MODELS, (IN GERMAN),
Forschungsinstitut, Borstel (West Germany). Inst. fuer Experimentelle Biologie und Medizin.
For primary bibliographic entry see Field 5C.
W79-01259

THE ECOTONE BETWEEN SPARTINA FOLIOSA TRIN. AND SALICORNIA VIRGINICA L. IN SALT MARSHES OF NORTHERN SAN FRANCISCO BAY: III. SOIL AERATION AND TIDAL IMMERSION,
California Univ., Berkeley. Dept. of Botany.
For primary bibliographic entry see Field 2L.
W79-01283

BIODEPOSITION BY SALT-MARSH INVERTEBRATES,
Georgia Univ., Sapelo Island. Marine Inst.
J. N. Kraeuter.
Marine Biology, Vol. 35, No. 3, p 215-223, April 16, 1976. 2 fig, 5 tab, 43 ref.

Descriptors: *Invertebrates, *Organic wastes, *Salt marshes, *Biogeochemical cycles, Deposition, Organic matter, Sediments, Productivity, Marshes, Estuaries, Biodeposition.

The importance of salt-march invertebrate biodeposits in biogeochemical cycles are discussed. Yearly biodeposition rates of nitrogen, phosphorus, potassium, magnesium, maganese, copper, zinc, and molybdenum are reported for 5 invertebrate species. The 5 species (Littorina irrorata, Arcatula demissa, Polymesoda caroliniana, Uca magnax and U. pugilator) deposit 1709 g dry weight m (2) year (-1), of which 455 g m(2) year (-1) is organic material. Calculations suggest that the invertebrates are capable of processing 53% of the marsh's yearly production, but the actual aount utilized is probably substantially less than this. (Maroncelli-Mass)
W79-01288

NITRATE AND NITRITE IN THE SURFACE WATERS OF TWO DELAWARE SALT MARSHES,
Delaware Univ., Newark. Dept. of Biological Sciences.
D. Aurand, and F. C. Daiber.
Chesapeake Science, Vol 14, No 2, p 105-111, June, 1973. 4 fig, 16 ref.

Descriptors: *Nitrate, *Nitrite, *Surface waters, *Delaware, *Salt marshes, Marshes, Control structures, Tidal exchange, Ditches, Inorganic compounds, Tides, Tidal waters, Tidal effects, Salinity, *Path of pollutants, Distribution.

The distribution of nitrate and nitrite in two Delaware salt marshes was studied from July 1966 through December 1967. Canary Creek Marsh, located near the mouth of Delaware Bay, was characterized by high salinity, low nitrate water. The Murderkill Marsh, in central Delaware, was characterized by low salinity, high nitrate water. Man-made control structures in the Murderkill Marsh inhibited free tidal exchange and modified the distribution of nitrate and nitrite. Maximum nitrate concentrations occurred in the winter, while minimum concentrations were observed during the summer. Summer nitrate concentrations in the Canary Creek Marsh ranged from undetectable (less than 2 micrograms-at/l) to 8 micrograms-at/l. Winter values were generally between 10 and 25 micrograms-at/l. At the Murderkill Marsh, winter nitrate concentrations ranged from 40-100 micrograms-at/l, and the summer concentrations were generally in the range of 5 to 20 micrograms-at/l. Nitrite concentrations in both areas rarely exceeded 1.5 micrograms-at/l, and exhibited no discernable seasonable pattern. The study suggests that ditching and control structures in marshland areas can have an inhibitory effect on the nutrient exchange with the estuarine community. (Maroncelli-Mass)
W79-01291

MICRO-INHABITANTS OF MARSH PEAT SOILS IN THE TOMSK REGION,
For primary bibliographic entry see Field 2H.
W79-01299

THE DECOMPOSITION OF SOME PEAT-FORMING PLANTS UNDER NATURAL CONDITIONS,
For primary bibliographic entry see Field 2H.
W79-01300

ROLE OF EXCREMENT OF INVERTEBRATES IN THE ACTIVATION OF MICROFLORA OF MARSH PEAT SOILS,
For primary bibliographic entry see Field 2G.
W79-01303

EFFECT OF FAILURE OF THE OLD RIVER CONTROL STRUCTURE ON MUNICIPAL AND INDUSTRIAL WATER SUPPLIES,
Louisiana State Univ., Baton Rouge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W79-01336

DISSOLVED ORGANIC CARBON FLUXES IN THE SHETUCKET RIVER OF EASTERN CONNECTICUT, USA,
Conneticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 5C.
W79-01337

MIXING AND DISPERSION IN ESTUARIES,
California Univ., Berkeley. Dept. of Civil Engineering.
H. B. Fischer.
Annual Review of Fluid Mechanics, Vol. 8, p 107-133. 1976. 6 fig, 91 ref, (California Water Resources Center Project UCAL-WRC-W-486).

Descriptors: *Estuaries *Mixing, *Saline water-freshwater interfaces, *Stratification, *Dispersion, *Path of pollutants.

Described are analytic techniques to try to understand the process of mixing in estuaries and to quantify such aspects as residence times and pollutant concentrations. In hydrodynamic terms all schemes distinguish three major categories of estuaries: sharply stratified estuaries, such as fjords and salt-wedge estuaries; partially stratified estuaries, in which there is a significant vertical-density gradient and vertical mixing is inhibited; and well-mixed estuaries. In this review only the latter two categories, are considered. An updated account is presented of knowledge of the causes of dispersion in estuaries. Emphasis is on the period 1967-1974. Current methods for predicting and modeling dispersion and how these are limited by the still incomplete understanding of the dispersion process are described. (Snyder-Calif Davis)
W79-01338

DISTRIBUTION OF BLUEGREEN ALGAE IN A MISSISSIPPI GULF COAST SALT MARSH,
Mississippi State Univ., Mississippi State. Dept. of Botany.
W. W. Sage.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 982, Price codes: A04 in paper copy, A01 in microfiche. MS Thesis, May 1978. 47 p, 1 fig, 15 tab, 19 ref. OWRT A-099-MISS(2), 14-34-0001-7052.

Descriptors: *Cyanophyta, *Salt marshes, *Sampling, *Biological communities, Ecological distributions, Salinity, Population, Distribution patterns, Schizothrix calcicola, Light intensity, Aquatic life, Ecotypes, Dominant organisms, Algae.

Samples of edaphic bluegreen algal communities were collected from five monotypic angiosperm zones in Graveline Bay Marsh near Ocean Springs, Mississippi, and later evaluated in the laboratory to determine the species distribution and relative abundances. Results showed that communities in all five zones of the marsh were dominated by Schizothrix calcicola (Ag.) Gom. throughout the year and subdominants varied seasonally. In all zones, the number of individuals was greatest in the summer and lowest in winter. Examining structure of the five edaphic communities indicated a single, nearly homogeneous community exists over the entire marsh surface which is shaded by an angiosperm canopy. Light intensity appears to be the major factor affecting distribution of bluegreen algae in this salt marsh, as has been found in other North Atlantic temperate salt marshes. Similarity indices were calculated for community pairs and species diversity was determined for each edaphic habitat. Relative abundance of 25 species is tabulated as well as descriptive habitat parameters, such as salinity, temperature, height of angiosperm canopy, and light energy in the blue band reaching the marsh surface. (Majtenyi-IPA)
W79-01356

FIELD STUDY OF SOLUTE MOVEMENT IN A HIGHLY AGGREGATED OXISOL WITH INTERMITTENT FLOODING: I. NITRATE,
Hawaii Univ., Honolulu. Dept. of Agronomy and Soil Science.
For primary bibliographic entry see Field 3F.
W79-01360

KOHL SPRING - BIOGEOCHEMISTRY OF A BLACKWATER SYSTEM,
Missouri Univ.-Columbia.
J. P. Murray.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 242, Price codes: A06 in paper copy, A01 in microfiche. M.A. thesis, September 1972 110 p. 12 fig, 21 tab, 43 ref. OWRT B-077-MO(1), 14-31-0001-3608.

Descriptors: Groundwater, Iron, Sulfides, Nitrogen, Phosphorus, Landfill leachate, Sewage lagoon, Geochemistry, *Missouri, *Kohl Spring(MO), Hydrogen sulfide, Iron sulfide, Water pollution sources, Water disposal.

The ground water in three localities which had changed from iron- and sulfide- free water to unpotable water contaning abundant hydrogen sulfide and colloidal iron sulfide was studied in detail. Each of these areas had sanitary land fill or industrial waste disposal operations and sewage lagoons or municipal sewage treatment plants within one mile of the polluted area. The distinction between groundwater pollution resulting from an influx of sanitary landfill leachate as opposed to contributions from sewage tratment facilities has been difficult because there are no individual dissolved species that are diagnostic of either type of contaminant. However, landfill leachates have ratios of total inorganic nitrogen to total phosphorous in the range 500-1500 which is very different from the ratios reported for raw waste-water (1.0) or sewage treatment plant effluent (2.0). In the absence of other obvious sources of nitrogen or phosphorous, the ratio of total inorganic nitrogen to total phosphorous shows considerable promise as a means of discrimination contamination from waste-water tratment facilities. The Data from the field studies indicate that the water polluton in each case was a result of improperly operated landfill or industrial waste disposal operations. (Carpenter-Missouri)
W79-01421

A CHEMICAL BUDGET OF A SOFT-WATER BOG LAKE: BENTHIC CONTRIBUTIONS,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 2H.
W79-01423

METHODS OF CONTAMINATION OF TWO FRESHWATER FOOD CHAINS BY COBALT 60: I. DIRECT CONTAMINATION OF THE ORGANISMS BY THE WATER (MODALITES DE LA CONTAMINATION DE DEUX CHAINES TROPHIQUES DULCAQUICOLES PAR LE COBALT 60: I. CONTAMINATION DIRECTE DES ORGANISMES PAR L'EAU),
CEA Centre d'Etudes Nucleaires de Cadarache, Saint-Paul-les-Durance (France). Lab. D'Etude de la Pollution des Eaux.
For primary bibliographic entry see Field 5C.
W79-01442

APPLYING A CHEMICAL MODELLING TECHNIQUE TO ECOLOGICAL PROBLEMS,
Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Physics and Engineering Lab.
G. A. M. King.
Ecological Modelling, Vol. 5, p 259-268, 1978. 2 fig, 6 ref, append.

Descriptors: *Model studies, *Computer models, Ecology, Mathematical models, Computer programs, Analytical techniques, Programming languages, Data collections, Data processing, Growth rates, Productivity, Trophic level, *Methodology, *Ecological modelling.

A very simple computer program can be adapted to handle both complicated chemical and ecological problems, by using procedures which reduce different reaction types and flows of material to one form. The process of reduction discloses similarities between ecological situations which, at first sight, seem very important. (EIS-Deal)
W79-01444

EXPERIMENTAL STUDY ON THE CONCENTRATION PROCESS OF TRACE ELEMENT THROUGH A FOOD CHAIN FROM THE VIEWPOINT OF NUTRITION ECOLOGY,
Okayama Univ. (Japan). Inst. for Agricultural and Biological Sciences.
I. Aoyama, Y. Inoue, and Y. Inoue.
Water Research, Vol. 12, p 831-836, 1978. 7 fig, 1 tab, 6 ref.

Descriptors: *Food chains, *Cesium, Heavy metals, Growth rates, Nutrient requirements, Ecology, Path of pollutants, Predation, Radioactivity techniques, Tracers, Fish physiology, Fish food organisms, Fish behavior, Mathematical models, Absorption, *Tissue analysis, Oryzias, Astronotus, *Bioaccumulation.

This paper describes the importance of a food chain in estimating the concentration of heavy metals from the viewpoint of nutrition ecology. The experiments were performed to investigate the effects of the following experimental conditions on the uptake of heavy metals by a predator, using 137Cs as a tracer; ration size per day, feeding interval and the change in weight of the predator fish. The set of results showed that (1) the concentration of a metal in predator fish increased with the ration size, (2) the feeding interval had no effect on the uptake of the metal by fish under the experimental conditions, and (3) the concentration in the growing fish was decreased with the increase of its weight. The paper also deals with the compartment model applied to the concentration process of the metal by a fish. The theoretical results depicted well the experimental ones. (EIS-Deal)
W79-01461

THE AVAILABILITY OF SEDIMENT-BOUND COBALT, SILVER, AND ZINC TO A DEPOSIT-FEEDING CLAM,
Geological Survey, Menlo Park, CA.
S. N. Luoma, and E. A. Jenne.
Available from the National Technical Information Service, Springfield, VA 22161 as CONF-750929-4, Price codes: A03 in paper copy, A01 in microfiche. Proceedings of Biological Implications of Metals in the Environment, 15th Life Sciences Symposium, Hanford, Washington, 31 p, 1975. 5 fig, 5 tab, 17 ref.

Descriptors: *Clams, *Uptake, *Silver, *Cobalt, *Zinc, *Sinks, Metals, Sediments, Bottom sediments, Physicochemical properties, Tracers, Radioactivity techniques, Benthic fauna, Carbonates, Animal physiology, Food chain, *Bioaccumulation, *Bioavailability, *Tissue analysis, *Macoma, Metal sediment association.

The availability to Macoma balthica of sediment-bound metals was dependent upon the physical-chemical nature of the metal-sediment association. Laboratory studies of bioaccumulation from individual sedimentary trace-element sinks labelled with radioactive tracers of Ag, Co and Zn indicated bioavailability varied among metals within a given sink and among sinks for a given metal. Little bioaccumulation was observed from several sinks which may be common in nature, e.g., little Zn or Co uptake was observed when those metals were coprecipitated with amorphic iron oxide or manganese oxide. However, Ag, Co, and Zn were all taken up from detrital organics and Ag was accumulated by the clam from the iron oxide precipitate. Even quantitatively minor sinks within aquatic sediments may be important sources of some metals for M. balthica. (EIS-Deal)
W79-01468

CHLORO-ORGANICS IN SURFACE WATER SOURCES FOR POTABLE WATER,
Oak Ridge National Lab., TN.
R. L. Jolley, and W. W. Pitt, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as CONF-77055-2, Price codes: A02 in paper copy, A01 in microfiche. In: Proceedings of the 1977 Disinfection Symposium, American Water Works Association, Held at Anaheim, California on May 8-13, 1977. 13 p, 2 tab, 53 ref.

Descriptors: *Potable water, *Surface waters, *Organochlorine compounds, *Chlorinated hydrocarbon pesticides, *Reviews, *Water pollution sources, Water supply, Organic compounds, Pesticide residues, Bioaccumulation, Pesticides, Point pollution, Nonpoint pollution, Agricultural runoff, Urban runoff, Sewage disposal, Land disposal, Fallout, Cooling waters, DDE, Atrazine, Dieldrin, Landfills.

Literature on the presence and formation of chlor-organics in natural waters is surveyed, with attention to: (1) point and nonpoint sources in surface waters, and (2) transport, distribution, degradation, and toxicity. Chloro-organics enter surface water from a variety of point sources, such as sewage treatment plant effluents, industrial process effluents, and chlorinated cooling waters from electric power-generating plants. Nonpoint sources include dust and particulate fallout, leachate from landfills and land disposal sites, agricultural runoff, and urban runoff. Studies indicate that agricultural runoff is the major source of surface water contamination. Current water treatment processes may not effectively or completely remove chlorinated pesticides and related materials; pesticide concentrations in finished potable waters of major cities drawing their supply from surface waters have ranged from 0.0004-0.002 ppb for dieldrin, 0.00-0.005 ppb for DDE, and 0.03-0.4 ppb for atrazine. Relatively little is known about transport, distribution, chemical and biological degradation, and toxicity of the majority of chloro-organics in surface waters. Concentrations of chloro-organics are generally in the ppb range or less, but bioaccumulation may enhance the ecological effects of organchlorine compounds. (Lynch-Wisconsin)
W79-01472

CORALVILLE WATER QUALITY STUDY ANNUAL REPORT, WATER YEAR OCTOBER 1, 1975 TO SEPTEMBER 30, 1976,
Iowa Univ. Iowa City, Inst. of Hydraulic Research.
D. B. McDonald.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A046 054, Price codes: A04 in paper copy, A01 in microfiche. IIHR Report 200, March 1977. 51 p, 27 tab, 4 ref. DACW25-76-C-0056.

Descriptors: *Coralville Reservoir(IA), *Water quality control, *Water pollution sources, *Iowa River, *Reservoirs, Flood control, Impoundments, Rivers, Streamflow, Iowa, Nonpoint pollution, Agricultural runoff, Data collections, Water chemistry, Hydrology, Lake morphometry, Dams.

Annual data gathered 1975-76 for the Coralville Reservoir Water Quality Project (Iowa City, Iowa), initiated in 1964, are consistent with results of prior studies. Limnology and water quality were influenced primarily by: (1)nonpoint agricultural pollution, (2) hydrological characteristics of the Iowa River, (3) morphometry of the reservoir, and (4) fluctuations in the reservoir's storage and pool level resulting from flood control operations. The study's purpose is to determine effects of a flood-control reservoir on chemistry and biology of the parent river. Samples were collected from the Iowa River upstream and downstream from the dam, and from various depths in the reservoir. Measured were termperature, conductivity, turbidity, DO, pH, plankton, carbon dioxide, alkalinity, phosphate, ammonia, nitrate, total and suspended solids, threshold odor, BOD5, total and fecal coliforms, and fecal streptocci. During most of the water year river inflow to the impoundment was substantially below normal, and mean monthly flows for August (278 cfs) and September (133 cfs) were the lowest 1956-76. The average for those months was 1438 and 603 cfs 1967-76. Orthophosphate, ammonia nitrogen, and total coliforms tend to be low during low-flow years such as 1976, and high during medium (1971) or high-flow years (1973). Low inflow and stable pool level were probably partly responsible for large plankton populations in the reservoir june-September. (Lynch-Wisconsin)
W79-01473

5C. Effects Of Pollution

CAN SALAMANDERS AND FROGS SURVIVE THE THREAT OF ACID PRECIPITATION,
Cornell Univ., Ithaca, NY.
F. H. Pough.
In: NAHO, a publication of the New York Museum, The State Education Department, Albany, NY., 12206, Vol. 11, No. 1, p 6-9, Spring 1978. OWRT A-077-NY(1), 14-34-0001-7068, 8034.

Descriptors: *Frogs, *Salmanders, *Breeding, *Acid precipitation, Amphibians, Ponds, New York, Ecosystems, Experiments, *Air pollution effects, Weather patterns.

As soon as Spring rains begin to melt the Winter snows in central New York, amphibians migrate to and enter into their breeding ponds and begin their generation process. Studies conducted at Cornell University have shown that as a result of the weather patterns prevailing over North America, central New York and southern New England receive the greatest impact of acid precipitation. Breeding habits of frogs and salamanders are described and various studies on the effects of acid precipitation on the propagation of these two types of amphibian are discussed.
W79-01005

DISTRIBUTION OF AUTOTROPHIC NITRIFYING BACTERIA IN A POLLUTED RIVER (THE PASSAIC),
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Environmental Science.
For primary bibliographic entry see Field 5B.
W79-01007

TOXICITY AND MUTAGENICITY OF 2,4,6-TRINITROTOLUENE AND ITS MICROBIAL METABOLITES,
California Univ., Berkeley, School of Public Health.
W. D. Won, L. H. DiSalvo, and J. Ng.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A026 497, Price codes: A02 in paper copy, A01 in microfiche. Applied and Environmental Microbiology, Vol. 31, No. 4, p 576-580, 1976. 2 fig, 4 tab, 9 ref.

Descriptors: *Explosives, *Toxicity, Oysters, Copepods, Chlorophyta, Larval growth stage, Salmonella, Cytological studies, Bacteria, Microbial degradation, Biodegradation, Metabolism, Chemical properties, Bioassay, Growth rates, Organic compounds.

TNT of explosive grade is highly toxic to marine forms that included freshwater unicellular green algae (Selenastrum capricornutum), tidepool copepods (Tigriopus californicus), and oyster larvae (Crassostrea gigas), and mutagenic to Salmonella typhimurium. On the basis of mutagenic assays carried out with a set of histidine-requiring strains of bacterium, TNT was detected as a frameshift mutagen that significantly accelerates the reversion rate of a frameshift tester, TA-98. In constrast, the major microbial metabolites of TNT appeared to be non-toxic and nommutagenic. (EIS-Katz)
W79-01012

EFFECT OF DDT AND POLYCHLORINATED BIPHENYLS ON CELL POPULATION GROWTH OF CRITHIDIA FASICULATA, A FLAGELLATED PROTOZOAN,
Armed Forces Radiobiology Research Inst., Bethesda, MD.
J. E. French, and J. F. Roberts.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A026 867, Price codes: A02 in paper copy, A01 in microfiche. Armed Forces Radiobiology Research Institute, Report AFRRI SR76-21, 21 p, May 1976. 6 fig, 2 tab, 19 ref.

Descriptors: *DDT, *Polychlorinated biphenyls, *Toxicity, *Growth rates, *Protozoa, Cytological studies, Pesticide toxicity, Metabolism, Chlorination, Bioassay, Chemical properties, Chlorinated hydrocarbon pesticides, Aroclors, Radioactivity techniques, Tracers, Carbon radioisotopes, Organic compounds, Path of pollutants, Biochemistry, *Crithidia.

Cell population growth inhibition of Crithidia fasciculata by cell density and cell protein assays after p,p'-DDT and polychlorinated biphenyl (PCB) exposure during exponential growth was analyzed. DDT was apparently not metabolized by this cell. In vitro tests indicated that PCB toxicity increased with decreasing percent chlorination of the mixture. Cell density correlated with cell protein as a measure of toxicity of PCB but not for p,p'-DDT. A critical concentration range was observed above which the effects were decreased relative to those from lower concentrations employed. The maximum concentration of DDT associated with the cellular compartment occurred by 6 hours of exposure. The sensitivity of C. fasciculata to DDT or PCBs makes it an appropriate model for further xenobiotic-cell interaction studies involving these compounds. An inexpensive and rapid screening method for toxic chemical compounds used by military organizations is of great importance. To meet these requirements, an inexpensive and quick screening method was developed using the protozoan C. fasciculata. (EIS-Katz)
W79-01013

BIOASSAYS ON MARINE ORGANISMS: ACUTE TOXICITY TEST OF MERCURY, CADMIUM, AND COPPER TO ARKSHELL, ANADARA BROUGHTONII, FROM JIN-DONG BAY, AND TO OYSTER, CRASSOSTREA GIGAS, FROM KWANGDO BAY, SOUTH COAST OF KOREA,
National Fisheries Research and Development Agency, Seoul (Republic of Korea).
J. S. Park, and H. G. Kim.
The Journal of the Oceanographical Society of Korea, Vol. 13, No. 1, p 35-43, 1978. 3 fig, 6 tab, 19 ref.

Descriptors: *Cadmium, *Mercury, *Copper, *Oysters, *Toxicity, Metals, Heavy metals, Mortality, *Bioassay, Animal behavior, Lethal limit, Water pollution effects, Commercial shellfish, *Mollusks, *Arkshell, Anadara.

Acute toxicity of mercury, cadmium, and copper to arkshell and to oyster was determined by static bioassays. During the observations of the opening rate of the shell mercury was the most sensitive toxicant causing the test animals to close their shellvalves together after being exposed to a mercury solution for an hour. Opening rate to cadmium and copper increased gradually at the higher concentration. The death rate of oysters for cadmium was lower than that of the mercury and copper test solutions. For oysters, mercury was the most toxic substance, and cadmium was the least toxic one. The medium lethal time (LT50) value decreased gradually at higher concentration of heavy metals. LC50 and LT50 data on the three substances was presented for both species. (EIS-Katz)
W79-01015

A BIOLOGICAL INVESTIGATION OF AN ORGANICALLY POLLUTED URBAN STREAM IN VICTORIA,
Monash Univ., Clayton (Victoria). Dept. of Zoology.
I. C. Campbell.
Australian Journal of Marine and Freshwater Research, Vol. 29, p 275-291, 1978. 6 fig, 3 tab, 59 ref.

Descriptors: Streams, *Biological communities, *Aquatic populations, *Domestic wastes, *Benthic fauna, Water pollution effects, Bioindicators, Invertebrates, Water quality, Aquatic microorganisms, Tubificids, Diptera, Monitoring, Water quality control, *Australia, *Dandenong Creek(Australia).

The macrofauna of Dandenong Creek, an organically polluted urban stream in Victoria, was studied. It was difficult to separate effects due to pollution from those due to other forms of interference. No true indicator species was found, but seven groups of common animals could be arranged in order of increasing pollution tolerance: Atalophlebiodes, Trichoptera, Chironomidae, Potamopyrgus, Bulinus, Tubificidae, and Psychodidae. Some of the difficulties of using biological systems for stream monitoring are discussed. (EIS-Katz)
W79-01016

IMPACT OF MINE DRAINAGE ON A MOUNTAIN STREAM IN PENNSYLVANIA,
Illinois Inst. of Tech., Chicago. Pritzker Dept. of Environmental Engineering.
R. D. Letterman, and W. J. Mitsch.
Environmental Pollution, Vol. 17, p 53-73, 1978. 9 fig, 4 tab, 33 ref.

Descriptors: *Mine drainage, *Benthic fauna, *Coal mine wastes, *Fish populations, *Iron compounds, Biomass, Sampling, Benthos, Acid mine water, Water quality, Mine wastes, Water pollution sources, Water pollution effects, Invertebrates, Biological communities, On-site investigations, Water temperature, Sculpins, *Pennsylvania, *Ben's Creek(Penn).

Physicochemical parameters and fish and benthic macroinvertebrates community structure were studied in a small mountain stream in western Pennsylvania. Sampling stations were located upstream and downstream of coal mine drainage in an otherwise unpolluted stream. Due to an alkaline discharge and significant upstream alkalinity the pH below the mine discharges remained between 6.5 and 8. The major factor affecting the benthic community and fish population appeared to be ferric hydroxide deposition. Rates of deposition during dry-weather conditions ranged from 3 grams per square meter per day near the discharges to 0.01 grams per square meter per day at the downstream end of the study site. The biomass of macroinvertebrates decreased from approximately 14 g wet wt per square meter above the discharges to 0.1-1.5 g wet wt per square meter within the area of iron disposition. Invertebrate diversity decreased significantly at the discharge but recovered to 75% of upstream values. The low but constant-temperature discharge from the mine may have enhanced the diversity recovery. The standing crop of fish decreased from approximately 228 to 11 kg/ha. Benthic fishes such as sculpin and suckers were the groups most affected. (EIS-Katz)
W79-01017

EFFECT OF MERCURIC CHLORIDE ON THE DIGESTIVE SYSTEM OF A TELEOST FISH, CHANNA PUNCTATUS,
D.A.V. Coll., Muzaffarnagar (India). Dept. of Zoology.
K. V. Sastry, and P. K. Gupta.
Bulletin of Environmental Contamination and Toxicology, Vol. 20, p 353-360, 1978. 2 tab, 17 ref.

Descriptors: *Mercury, *Digestion, *Toxicity, *Enzymes, Animal metabolism, Fish physiology, Heavy metals, Bioassay, Biochemistry, Amino acids, Proteins, Water pollution effects, Path of pollutants, Mode of action, *Teleost fish, *Tissue analysis, *Channa punctatus.

The effect of 1.8 mg/liter (LC50) of mercuric chloride exposure on the activities of alkaline phosphatase, acid phosphatase, glucose-6-phosphatase, amylase, pepsin, trypsin, tripeptidase glycyl-glycine dipeptidase, and carnosinase has been examined in Channa puncatatus. The three phosphatases have been inhibited in the liver but showed an increase in activity in the intestine and pyloric caeca. Amylase, pepsin, and trypsin have also shown a slight increase in activity. There has been no significant alteration in the activities of the peptidases. The results have shown that mercury inhibits the activities of phosphatases in the liver but has no significant effect on the digestive enzymes within the experimental period of 96 hours. (EIS-Deal)
W79-01019

SHELL STRUCTURE OF IMMATURE ROMAN SNAILS (HELIX POMATIA) AFTER EXPOSURE TO P,P'-DDT,
Nature Conservancy, Abbots Ripton (England). Monks Wood Experimental Station.
A. S. Cooke.
Environmental Pollution, Vol. 17, p 31-37, 1978. 1 tab, 3 fig, 9 ref.

Descriptors: *DDT, *Animal physiology, *Snails, *Environmental effects, Calcium carbonate, Invertebrates, Calcium, Mollusks, Gastropods, Electron microscopy, Water pollution effects, Chlorinated hydrocarbon pesticides, Pesticide residues, *Helix pomatia, *Shell thickness(Snails), *Sublethal effects.

Shells were examined from immature snails (Helix pomatia) that had been treated with DDT or deprived of access to calcium carbonate. Exposure to DDT resulted in shell thinning with the thickness of each of the three structural layers being inversely related to the body burden of DDT. The normal crossed lamellar structure was distorted in some of the thin shells. Withholding calcium carbonate led to similar changes, and DDT may cause thin shells by impairing calcium metabolism. (EIS-Katz)
W79-01020

ABUNDANCE, DIVERSITY, AND STABILITY IN SHORE-ZONE FISH COMMUNITIES IN AN AREA OF LONG ISLAND SOUND AFFECTED BY THE THERMAL DISCHARGE OF A NUCLEAR POWER STATION,
Battelle Columbus Lab., Duxbury, MA.
R. E. Hillman, N. W. Davis, and J. Wennemer.
Estuarine and Coastal Marine Science, Vol. 5, p 355-381, 1977. 13 tab, 6 fig, 25 ref.

Descriptors: *Biological communities, *Seasonal, *Environmental effects, *Marine fish, *Silversides, Fish populations, Fish, Populations, On-site investigations, Sampling, Nuclear powerplants, Ecological distribution, *Thermal pollution, Killifishes, Estuarine environment, *Connecticut, *Species diversity, *Millstone Point(Conn), Menida.

Shore-zone fish communities in the area of a nuclear power station at Millstone Point, Connecticut, on Long Island Sound, were studied from May 1969 through December 1975. Over 81,500 fish, representing at least 35 species, were collected. Species diversity, species richness, and species evenness indexes were calculated for 4 affected and 2 control sites for each year. In addition, the degree of community similarity at each site was assessed year to year. The most abundant species at each site was the Atlantic silverside, Menida menida. In general, species diversity, richness, and evenness fluctuated at each site seasonally and from year to year such that no trends could be determined. There was a distinct shift in community similarity through 1974 and 1975 at most sites. Since no evidence could be found that operation of the power station was responsible for the changes, it was concluded that such fluctuations were natural, and would be observed in any ecosystem if it were studied for several consecutive years. It is suggested that the concept of community or ecosystem stability be re-examined and possibly redefined in light of these distinct fluctuations over 6 years. (EIS-Katz)
W79-01021

CHLORINATED HYDROCARBONS IN MARINE INSECTS,
Scripps Inst. of Oceanography, La Jolla, CA.
For primary bibliographic entry see Field 5B.
W79-01023

THE FEASIBILITY OF SUSPENSION CULTURE OF OYSTERS (CRASSOSTREA VIRGINICA) AT A PETROLEUM PLATFORM OFF THE TEXAS COAST,
Moody Coll. of Marine Sciences and Maritime Resources Galveston, TX.
J. Ogle, S. M. Ray, and W. J. Wardle.
Contributions in Marine Science, Vol. 21, p 63-76, 1978. 5 fig, 4 tab, 18 ref.

Descriptors: *Aquiculture, *Oysters, *Commercial shellfish, *Growth rates, *Offshore platforms, Shellfish, Invertabrates, Mollusks, Estuarine environment, Habitats, Chlorophyll, Environmental effects, Oil industry, Phytoplankton, Mortality, Methodology, Animal diseases, *Suspension culture.

Offshore and estuarine oysters (120 of each group ranging from 42 to 87 mm length) were suspended at two levels in plastic mesh 'Vexar' bags. The rate of growth of oysters in terms of length was not significantly differnt for depth or for station between the two groups. The rate of growth in terms of weight was significantly greater for the estuarine oysters due to a significantly greater rate of growth for oysters at the lower level of that station. The condition index of oysters was higher at the estuarine station than offshore. The chlorophyll-a level in the estuary was twice that offshore, indicating a denser phytoplankton standing crop. However, generic composition of the phytoplankton was similar in both stations. Mortality was greater offshore (51 of 120) than at the estuarine station (32 of 120) and was possibly related to the greater incidence of the fungus Labyrinthomyxa marina in the offshore oysters. The problems of adequately containing oysters, obtaining spat and securing disease free oysters must be dealt with before an adequate assessment can be made for using petroleum platforms to culture oysters offshore. (EIS - Katz)
W79-01024

THE TOXIC EFFECTS OF THE WATER SOLUBLE FRACTIONS OF NO. 2 FUEL OIL AND THREE AROMATIC HYDROCARBONS ON THE BEHAVIOR AND SURVIVAL OF BARNACLE LARVAE,
Texas Univ. at Austin, Port Aransas. Port Aransas Marine Lab.
R. Blundo.
Contributions in Marine Science, Vol. 21, p 25-37, 1978. 1 tab., 9 fig, 13 ref.

Descriptors: *Crustaceans, *Toxicity, *Mortality, *Oil, *Bioassay, *Toxins, *Animal behavior, Organic compounds, Invertebrates, Laboratory tests, Water pollution sources, Larvae, Oily water, Oil pollution, *Barnacles, Balanus eburneus, *Naphthalene, *Toluene, *Benzene, *Phototactic behavior, *Fuel oil, *Sublethal effects.

Freshly released nauplii of Balanus eburneus were exposed to test solutions of Exxon fuel oil, naphthalene, benzene, and toluene, in sea water. After 1 hour those larval actively swimming were separated from those resting on the bottom;; all larvae were counted. In other experiments mortalities were determined by vital staining with neutral red. All substances were most harmful when used immediately after preparation. The fuel oil was much less harmful after it had been to air for 3 days. In 1 hour experiments, half the larvae continued swimming at dilutions of stock solutions as follows: No. 2 fuel oil 12.5%, naphthalene 15%, toluene 12.5%, benzene 11%. The results were indicative of interference with swimming and phototactic behavior. Mortalities in 1-hour experiments did not exceed 13%. From the results it is concluded that volatile aromatics including maphthalene, toluene, and benzene, are responsible for much of the deleterious effects on activity and survival of barnacle larvae. (EIS - Katz)
W79-01025

UPTAKE OF ZINC BY THE AQUATIC LARVAE OF SIMULIUM ORNATIPES (DIPTERA: NEWATOCERA),
Australian National Univ., Canberra. Dept. of Zoology.
J. G. T. Carter, and W. L. Nichols.
Australian Journal of Marine and Freshwater Research, vol. 29, p 299-309, 1978. 3 fig., 4 tab., 16 ref.

Descriptors: *Absorption, *Zinc, *Larvae, *Toxicity, *Bonding, Analytical techniques, Path of Pollutants, Metals, Larval Growth Stage, Bioassay, Zinc Radioisotopes, Radioisotopes, Metabolism, Heavy metals, Chemical properties, Aquatic insects, *Simulium, *Bioaccumulation.

The uptake and loss of zinc by the aquatic larvae of the blackfly S. ornatipes was investigated using radioactive 65Zn. Larvae may absorb significant quantities of zinc from solution, and a substantial proportion remains in the body when larvae are transferred to zinc-free water. Uptake is assisted by metabolism, but an increase of the calcium ion concentration, although reducing toxcity, has no effect on uptake exchange or the loss of zinc. Larvae may be fractionated into 'cuticle', 'high-' and 'low-molecular-weight' fractions, based on solubility in water and 80% (v/v) ethanol. In the cuticle and high-molecular-weight fractions two 'pools' may be identified by dialysis against Na(3) EDTA- a pool in which zinc is weakly held and exchanges rapidly with the zinc in solution, and on where zinc is held and exchanges rapidly with the zinc in solution, ad one where zinc is held and exchanges slowly. Exposure time, temperature, and external concentration influence the quantity of zinc entering these pools. Washing the cuticle and high-molecular-weight fractions with a series of buffers suggests that zinc is bound by phenolic groups in the cuticle fraction, and by phosphonic acids in the high-molecular-weight fracton. Sulfhydryl groups did not bind a major portion of the zinc. (EIS-Katz)
W79-01026

BIOLOGICAL CONTROL AGENTS OF SEWAGE BACTERIA IN MARINE HABITATS,
New South Wales Univ., Kensignton, Australia. School of Microbiology.
M. M. Roper, and K. C. Marshall.
Australian Journal of Marine and Freshwater Research Vol. 29, p 335-343, 1978. 1 tab, 7 fig, 12 ref.

Descriptors: *Biocontrol, *Biological communities, *Aquatic microorganisms, *Sewage effluents, *Succession, *E. coli, *Marine bacteria, Myxobacter, Aquatic bacteria, Distribution patterns, Predation, Populations, Parasitism, Water pollution effects, Domestic wastes, Aquatic microbiology, Vexillifera, Polyangium, *Bdellovibrios.

The introduction of Escherichia coli into natural seawater results in a direct response from the natural microbial parasites and predators, which increase in number and rapidly destroy the alien coliform bacteria. In a predictable successional sequence, the decline in numbers of E. coli was followed by a reduction in the parasite and predator populations resulting from the absence of suitable host organisms and from predation by larger protozoa. E. coli numbers declined more rapidly in seawater taken from near a sewage outlet, because the parasites and predators were enriched by the constant availability of host organisms. A slower rate of decline of E. coli numbers in seawater samples taken further from the outlet was attributed to lower initial populations of parasites and predators. Two common marine predators of E. coli, a fruiting myxobacter (Polyangium) and a small amoeba (Vexillifera), have been characterized. (EIS-Katz).
W79-01027

TOTAL MERCURY AND METHYL MERCURY CONTENTS IN FISH FROM LAKE PAIJANNE,
Jyvaskyla Univ. (Finland). Dept. of Chemistry.
M. L. Hattula, J. Sarkka, J. Janaiunen, J. Passivirta, and A. Roos.
Environmental Pollution, Vol. 17, p 19-29, 1978. 2 fig, 3 tab, 31 ref.

Descriptors: *Mercury, *Path of pollutants, *Absorption, *Food chains, *Freshwater fish, *Commercial fish, Heavy metals, Water pollution sources, Food webs, Public health, Size, Industrial wastes, Pulp wastes, Smelts, Pikes, Analytical techniques, *Lake Paijanne(Finland), *Bioaccumulation.

The total mercury and methyl mercury contents of freshwater fish from Lake Paijanne, Finland, are studied. This is the second largest lake in Finland and has been quite heavily contaminated by mercury. The fish from the limnologically cleanest areas had the largest concentrations of mercury. Twelve species of fish (1774 analyses of total mercury and 157 of methyl mercury) were analysed during a four-year period. Total mercury was measured by flameless atomic absorption and by gas-liquid chromatography. The average mercury concentration for all fish was 0.65 mg/kg on a fresh weight basis, of which 98.7% was in a methylated form. The concentration of mercury in fish differed in different parts of the lake and also depended on the weight of the fish. (EIS-Katz)
W79-01028

CHLORINATED HYDROCARBONS AND MERCURY IN AQUATIC VASCULAR PLANTS OF LAKE PAIJANNE, FINLAND,
Jyvaskyla Univ. (Finland). Dept. of Biology.
J. Sarkka, M. L. Huttula, J. Janatuinen, and J. Paasivirta.
Bulletin of Environmental Contamination and Toxicology, Vol. 20, p 361-368, 1978. 1 fig, 5 tab, 10 ref.

Descriptors: *Polychlorinated biphenyls, *DDT, *Mercury, *Pesticide residues, *Aldrin, *Plant tissues, Chlorinated hydrocarbon pesticides, Plant physiology, Plant populations, Food webs, Metals, Heavy metals, DDE, Pesticide kinetics, Gas chromatography, Path of pollutants, *Tissue analysis.

This is part of a study of the chlorinated hydrocarbons and mercury residues in the food webs of the lake. Data was collected to research differences in the residue levels between the regions of the lake, years, and species and trophic levels. A temporal decrease in the plant concentrations of PCB and

total DDT (DDT and metabolites) was correlated with decreased utilization of these compounds in the region. Of the chlorinated hydrocarbons, PCB was present in the highest concentrations. Data was presented on temporal trends, regional differences and species concentrations. (EIS-Deal)
W79-01029

CHANGES IN SUBMERGED AQUATIC MACROPHYTE POPULATIONS AT THE HEAD OF CHESAPEAKE BAY, 1958-1975,
Florida Univ., Gainsville, FL. Dept. of Environmental Engineering Sciences.
S. Bayley, V. D. Stotts, P. F. Springer, and J. Steenis.
Estuaries, Vol. 1, No. 3, p 73-84, September 1978. 2 tab, 6 fig, 40 ref.

Descriptors: *Chesapeake Bay, *Plant populations, *Submerged plants, *Succession, Aquatic plants, Turbidity, Salinity, Environmental effects, Waterfowl, Biological communities, Distribution patterns, *Susquehanna Flats(Maryland), *Species diversity, *Milfoil, Eurasian milfoil.

Submerged aquatic plant populations in the Susquehanna Flats of the Chesapeake Bay were followed for 18 years. An exotic species, eurasian water milfoil, Myriophyllum spicatum, increased dramatically from 1958 to 1962; at the same time the dominant native species declined. After 1962, milfoil populations declined and the native rooted aquatics gradually began to return to their former levels. In the late 1960's all species declined and in 1972 almost disappeared from the Susquehanna Flats. These fluctuations may have been related to several interrelated environmental factors in the Chesapeake Bay, including tropical storms, turbidity, salinity, and disease. The utilization of the Susquehanna Flats by waterfowl appears to be related to the abundance and species composition of the submerged macrophytes present. (EIS-Katz)
W79-01030

EFFECTS OF CHROMIUM ON SOME AQUATIC PLANTS,
Environmental Assessment Council, Inc., New Brunswick, NJ.
J. Mangi, K. Schmidt, J. Pankow, L. Gaines, and P. Turner.
Environmental Pollution, Vol. 16, p 285-291, 1978. 4 fig, 8 ref.

Descriptors: *Plant growth, *Adsorption, *Toxicity, *Algae, *Chromium, Bioassay, Mortality, Pollution abatement, Water pollution effects, Industrial wastes, Laboratory tests, Growth rates, Aquatic plants, Aquatic life, Environmental effects, *Pennsylvania, *Susquehanna River(Penn), *Duckweed, Lemna, *Spirodella.

The effect of chromium on algae and duckweed from the upper Susquehanna river was determined. Duckweed was exposed to chromium in concentrations from 0.003 to 10 ppm and algae was exposed to concentrations from 0.01 to 10 ppm. The growth of all plants was inhibited by 10 ppm chromium. The uptake of chromium varied linearly with the concentration of chromium present. At higher levels of chromium, the ratio taken up by the plants to the concentration in the initial medium was not as great as at lower levels. It is possible that through adsorption of chromium on their cell walls, benthic and planktonic algae may remove a relatively large load of the heavy metal from the water. Such a mechanism would be partially responsible for cleansing polluted rivers of the heavy metal. (EIS-Katz)
W79-01031

IN VITRO CHANGES IN THE ACTIVITY OF ATPASES IN THE GILLS OF CARCINUS MAENAS EXPOSED TO VARIOUS CONCENTRATIONS OF P,P'-DDT,
Plymouth Polytechnic, (England).
P. E. Jowett, M. M. Rhead, and B. L. Bayne.
Environmental Pollution, Vol. 17, p 1-6, 1978. 1 fig, 1 tab, 21 ref.

Descriptors: *DDT, *Animal physiology, *Inhibitors, *Crabs, *Biological membranes, *Enzymes, Water pollution effects, Chlorinated hydrocarbon pesticides, Invertebrates, Crustaceans, Pesticides, Metabolism, Laboratory tests, Ion transport, *Carcinus, *ATPase.

Enzyme preparations of gill homogenates from the shore crab (Carcinus maenas) were exposed to concentrations of p,p'-DDT in ethanol (95%), ranging from 10-10 M to 10-15 M DDT. The specific activities of Mg+2-ATPase, Na+, K+-ATPase and Total (Na+, K+, Mg2+)-ATPase were assayed. Mg2+-ATPase activity was inhibited at all concentrations of DDT. Na+, K+-ATPase was slightly stimulated at all concentrations. The activity of Total-ATPase was unaffected at the lower concentrations but was inhibited at higher concentrations. (EIS-Katz)
W79-01032

THE EFFECT OF TEMPERATURE ON THE DEVELOPMENT OF DIAPAUSING AND SUBITANEOUS EGGS IN SEVERAL FRESHWATER COPEPODS,
Canada Centre for Inland Waters, Burlington (Ontario).
J. M. Cooley.
Crustaceana, Vol. 35, No. 1, p 27-34, 1978. 2 tab, 2 fig, 17 ref.

Descriptors: *Copepods, *Water temperature, *Zooplankton, *Seasonal, Hatching, Environmental effects, *Diapause, Temperature, Growth stages, Life cycles, Animal physiology, Environmental effects, Aquatic animals, Crustaceans, Invertebrates, *Cyclopoids, *Diaptomids, *Egg development.

Subitaneous egg development was measured at 5 to 7 temperatures using freshly caught zooplankton from two cyclopoids and two diaptomids. Development time for first naupliar instars of the 2 diaptomids were also estimated. Diapausing eggs were estimated and exposed to a number of temperature and light treatments. Egg development times in the 2 calanoids are similar at temperatures from 14 to 23C but are grossly different at cooler temperatures. NI development times are very similar for both diaptomids even at 4C, a temperature that this instar never experiences. The hatching response of resting eggs incubated in the laboratory at 4C supports the idea that Leptodiaptomus minutus is adapted to a winter existence and Aglaodiaptomus spatulocrenatus to warmer water. In many cyclopoid species it appears as though the diapause stage and subsequent emergence of the copepodids from the mud is crucial for continuation of the species since there may be a total absence of overwintering instars. (EIS-Katz)
W79-01033

GULL DROPPINGS AND THEIR EFFECTS ON WATER QUALITY,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 5B.
W79-01041

TRACE METAL ENHANCEMENT IN THE BIOTIC AND ABIOTIC COMPONENTS OF AN ESTUARINE TIDAL FRONT,
Delaware Univ., Lewes. Marine Studies Complex.
For primary bibliographic entry see Field 5B.
W79-01046

EFFECT OF COPPER AND TRI- AND HEXAVALENT CHROMIUM ON THE WORK OF AN ACTIVATED SLUDGE,
Warsaw Univ. (Poland). Dept. of Environmental Microbiology.
For primary bibliographic entry see Field 5D.
W79-01079

THE EFFECTS OF LAND USE ON PHOSPHORUS LOADING: A CASE STUDY - SIX MILE RUN RESERVOIR,
Rutgers University Dept. of Environmental Science New Brunswick, New Jersey.
S. J. Souza.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 831, Price code: A10 in paper copy, A01 in microfiche. MS Thesis, 198 p, 48 fig, 62 tab, 1277 ref. OWRT A-043-NJ, (3).

Descriptors: *Reservoirs, *Eutrophication, Watershed management, Trophic level, Phosphorus, Pumped storage, *Land use, *New Jersey, *Six Mile Run Reservoir(NJ), Water pollution effects, *Nutrient loading models, *Trophic potential, Chlorophyll 'a'.

Six Mile Run Reservoir, a 23.96 x 106m3 pumstorage facility,is slated for construction in Franklin Township, N.J. The reservoir will serve a recreational and water supply function. Concern was generated over the possible accelerated eutrophication of the reservoir. In many cases, poor land use management in a lake or reservoir drainage basin can lead to a significant decrease in water quality and recreational utilization (Tuffey and Baker, 1975). Although yet in the planning stages, the trophic effect resulting from improper land use on Six Mile Run Reservoir could be investigated. Due to its limiting nature in most freshwater systems, phosphorus was considered the nutrient which would control the rate of eutrophication. It was necessary to assess existing and future phosphorus loads in relation to land use and predict the trophic potential. The existing phosphorus load was obtained following a year-long sampling program at five stations during steady state, background, and storm conditions. Relationships between phosphorus, suspended solids, and flow were investigated. Future loads were calculated through the land use-phosphorus input method of Uttormark, et al (1974). The trophic potential of existing and future loads was predicted with the empirical model of Dillon (1974b). An additional empirical model (Dilon and Rigler, 1974A) was employed to convert predicted spring total phosphorus concentrations to peak summer chlorophyll 'a' concentrations. Trophic potential and chlorophyll 'a' data for Six Mile Run Reservoir were compared to similar data generated for other New Jersey lakes and impoundments. The effects of land use, phosphorus loading, and trophic response were discussed in relation to the water quality and recreational utilization of the reservoir. Some solutions to predicted excessive phosphorus loading stimulated by improper basin managment were presented.
W79-01086

A BIOASSAY TECHNIQUE TO EVALUATE THE EFFECT OF SECONDARY EFFLUENT ON ALGAL INTERACTIONS IN THE CONNECTICUT RIVER,
Connecticut Univ., Storrs. Inst. of Water Resources.
F. R. Trainor, and L. G. Harter.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 642, Price codes: A02 in paper copy, A01 in microfiche. Completion Report, 1978. 11 p, 1 tab, 4 fig, 23 ref. OWRT A-075-CONN(1), 14-34-0001-8007.

Descriptors: *Algae, *Carrying capacity, Computer programs, Laboratory tests, Sewage treatment, *Connecticut River, Bioassay, Waste assimilative capacity, *Bialgal assay, *Secondary effluent effects, Algal interactions, Golenkinia sp., Cyclotella meneghiniana, Oscillatoria sp.

A bialgal assay has been developed which can be used in municipal or industrial laboratories to measure the carrying capacity of the Connecticut River. The selection of the green alga, Golenkinia sp., and the diatom, Cyclotella meneghiniana, enables the assay to be practicable throughout the year. Initial cell numbers in the inocula are critical concerning the outcome of algal interactions. The effect of secondary effluent in small amounts stimulates the green algal population. The addition of more secondary effluent favors the growth of diatoms. The increased amount of secondary effluent permits a proliferation of diatom species in con-

junction with a slower rate of algal succession. A trialgal assay employing the blue-greenalga, Oscillatoria sp., can work during summer pollution seasons. Oscillatoria sp., a temperature dependant alga, can operate in laboratory assay comparable to nature during late summer - early fall periods.
W79-01089

SEDIMENTATION AND MICROBIAL METABOLISM IN A SHALLOW ESTUARY,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 2J.
W79-01091

PRE-MANAGEMENT ASSESSMENT OF AQUATIC MACROINVERTEBRATES IN A SMALL, SEDIMENTARY DRAINAGE AREA OF THE MAUMEE AND LAKE ERIE BASIN,
Purdue Univ., Lafayette, IN. Dept. of Entomology.
W. P. McCafferty.
The Great Lakes Entomologist, Vol. 11, No. 1, p. 37-43, 1978. 1 fig, 2 tab, 5 ref. USEPA G005103.

Descriptors: *Aquatic insects, *Assessment, *Soil conservation, Crustaceans, Erosion pollutants, Invertebrates, *Indiana, *Pre-management, *Watersheds(Basins), Macroinvertebrates, Maumee Basin(Ind), Lake Erie Basin(Ind), Black Creek watershed(Ind).

In order to establish baseline data adjunct to the research and development of soil conservation practices for sediment reduction in the Maumee River and Lake Erie, the aquatic macroinvertebrates of Black Creek and adjacent areas in northeastern Indiana were studied from 1974-1975. A total of 90 species of Insecta and Crustacea were taken, 69 from Black Cree. Species diversity indices ranged from 1.04 to 2.75 in two downstream locations and were generaly reflective of stressed conditions related to channelization and sedimentation from the agrarian drainage area. Benthic species from the adjacent Maumee River potentially contribute in part to population maintenance in Black Creek.
W79-01096

EXCEPTIONAL TOLERANCE TO LOW PH OF SOME TROPICAL BLACKWATER FISH,
The Pennsylvania State Univ., Dept. of Biology.
W. Dunson, F. Swarts, and M. Silvestri.
Journal of Exceptional Zoology Vol 201 No 2, p 157-162, August, 1977. 4 fig., 1 tab., 20 ref. OWRT A-042-PA(2). 14-34-0001-6039.

Descriptors: *Fish, *Hydrogen ion concentration, *Rivers, Sodium, Tropical Blackwater fish, *Blackwater River, *Acid treatment, Guppies, Tetras, Ion balance, Gill, Skin, Kidney.

Cardinal, neon, and emperor tetras (Cheirodon axelrodi, Hyphessobrycon innesi, Nematobrycon palmeri), small South American characin fish often found in acidic blackwater rivers, have an unusual tolerance to sulfuric acid solutions of low pH. Most cardinal tetras with stand immediate transfer to water at pH 3.5 for an indefinite period. With gradual adjustment to further stepwise lowering of the pH, one individual survived at a pH of 3.1 for five weeks. This is by far the most acidic solution known to be tolerated for extended periods by any fish. The lower incipient lethal level (for 50% survival) is estimated to be about 3.35 for neon and cardinal tetras. On the other hand, common guppies (Poecilia reticulata), a species generally considered to be highly resistant to environmental change, all died after 11 days at pH 4.75. Both guppies and tetras lose large amounts of body sodium on exposure to lethal pH's. (Sink - Penn. State)
W79-01098

OXIDATION-REDUCTION CHEMISTRY AND AQUEOUS AMMONIUM OXIDATION IN THE ESTIMATION OF NITRATE BY THE CADMIUM REDUCTION METHOD,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Chemical and Biochemical Engineering.
For primary bibliographic entry see Field 5B.
W79-01100

HEAVY METAL ACCUMULATION AND ITS EFFECT ON THE BIOTA OF AN INDUSTRIAL SETTLING POND,
Montana Univ., Missoula. Dept. of Zoology.
For primary bibliographic entry see Field 5D.
W79-01124

ON THE MECHANISMS OF CO2 AND CH4 PRODUCTION IN NATURAL ANAEROBIC ENVIRONMENTS,
Indiana Univ. at Bloomington. Dept. of Chemistry; Indiana Univ. at Bloomington. Dept. of Geology; and Indiana Univ. at Bloomington. Water Resources Research Center.
L. M. Games, and J. M. Hayes.
In 'Environmental Biogeochemistry', Vol 1. Carbon, Nitrogen, Phosphorus, Sulfur and Selenium Cycles, edited by Jerome Nriagu. Ann Arbor Science Publishers, Inc., Ann Arbor, Michigan. Chapter 5, p 51-73, 1976. 4 fig, 4 tab, 32 ref. NGR 15-003-118.

Descriptors: *Methane, *Carbon dioxide, *Anaerobic bacteria, Methane bacteria, Sludge digestion, Water pollution, Organic materials, Landfills, Sewage sludge, Anaerobic conditions, Biogeochemistry.

Methane and carbon dioxide produced in the anaerobic decay of organic matter as found in conditions of a sanitary land fill are involved in the potential pollution of the groundwater. The isotopic compositions of CO2 and CH4 are metabolically interrelated, but this relationship is complicated by involvement of acetate. Because methane can arise from acetate or CO2, and CO2 itself can be produced from acetate and other molecules, no simple relationship can be discerned in complex environments. The various environments considered show different fractionation factors for CO2 and CH4 and also for each as they relate to the organic matter. These differences are apparently a result of changes in the microbial ecology in response to changes in the type and availability of nutrients. This can be concluded from the results of the laboratory reactor operated as a closed system, insofar as the experiment approximated the changing conditions observed when organic matter is utilized in the natural environment. (Wiersma-Purdue)
W79-01135

LIMNOLOGICAL CHARACTERISTICS OF THE POTOMAC ESTURY,
Corvallis Environmental Research Lab., OR.
N. A. Jaworski.
In: North American Project--A Study of U.S. Water Bodies; Publication No. EPA-600/3-77-086, July 1977. p 402-425. 3 fig, 4 tab, 10 ref.

Descriptors: *Potomac estuary, *Estuaries, *Limnology, *Water pollution effects, *Eutrophication, *Nutrients, Phosphorus, Potomac River, Rivers, Trophic level, Waste water disposal, Dissolved oxygen, Nuisance algae, Water pollution sources, Vollenweider models, Domestic wastes, Municipal wastes, Mathematical models, River basins, District f Columbia, Maryland, Virginia.

Eutrophication of the Potomac Estuary, much more pronouced than in other North Atlantic Coast estuaries, is primarily due to domestic wastewater discharges from the metropolitan Washington, D.C. area. Trophic conditions include high coliform counts, Low dissolved oxygen, and nuisance algal growth. Current phosphorus loading rates are 89.6g/sq myr for the upper estuary, 17.4 for the upper and middle, and 5.0 for the upper, middle, and lower. Application of Vollenweider's plot of critical phosphorus loadingas a function of mean depth/hydraulic residence time indicates the estuary has a much higher nutrient-assimilating capacity than lakes, and can tolerate a high trophic state because it is a well-mixed system. Loading concepts appear applicable to the estuary, although higher excessive and permissible loadings must be specified. Critical phosphorus loadings compare favorabel with estimates derived from historical data and mathematical modelling efforts. The Potomac River basin which includes the estuary isthe second largest in the MIddle Atlantic States, with a drainage area of 38,000 sq km and about 3.3 million population. The upper basin is largely rural. Land use in the basin is estimated at 55% forest, 40% agricultural, and 5% urban. Analysis of the estuary is complicated by salinity and light-limiting conditions. (See also W78-12895) (Lynch-Wisconsin)
W79-01195

OBSERVATIONS ON ALGAL POPULATIONS AND EXPERIMENTAL MATURATION POND SYSTEM,
Council for Scientific and Industrial Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5D.
W79-01196

FRESH-WATER WEEDS ARE A RESOURCE,
Rothamstead Experimental Station, Harpenden, (England).
N. W. Pirie.
Appropriate Technology, Vol. 4 No. 4, p 15-17, February 1978. 21 ref.

Descriptors: *Aquatic weeds, *Beneficial use, *Water hyacinth, *Nutrient removal, *Harvesting, *Feeds, *Tertiary treatment, *Sewage treatment, Eichhornia crassipes, Nutrients, Fertilizers, Food, Proteins, Methane, Fiber crops, Pulp and paper industry, Fish farming, Biocontrol, Nitrogen, Phosphorus, Eutrophication, Forages, Aquiculture, Manatees.

Beneficial uses of aquatic weeds are discussed, especially uses of water hyacinth (Eichhornia crassipes). Besides nutrient removal in tertiary sewage treatment systems, aquatic weeds can provide sources of: (1) fertilizer; (2) feed or fodder for pigs, cattle, water buffalo, sheep, ducks, and fish;(83) methane (biogas);(83) methane (biogas); 84) fiber for making pper and cardborad; (5) pharmacologically active extracts; (6) protein; and (7) human food. Floating weeds such as water hyacinth depend entirely on nutrients in the water, and it is estimated that one hectare can yield 0.5 tons per day of dried weed in warm weather. With an average composition of 3% nitrogen and 0.3% phosphorus, and assuming an average daily yield over a year of 0.15 ton, a year's harvest would produce one ton of nitrogen and 0.1 ton of phosphorus, or enough fertilizer for 3-4 hectares of arable land. Mechanical harvesting is complicated by the 10 tons of water accompanying each half-ton of dry matter. While feeding acceptance of hyacinth by pigs and cattle is not a problem, its nutritional value remains uncertain. Some protein can be extracted with difficulty from hyacinth and the partly dried press-cake waste can provide raw material for paper-making. Disintegrated leaves can be used as feed in fish farming. other potentially useful weeds are nile cabbage (Pistia), the floating ferns Salvinia and Azolla, duck-weed (lemna), Wolffia, and water spinach (Ipomaea aquatica). (Lynch-Wisconsin)
W79-01197

QUANTITATIVE AND QUALITATIVE CHANGES IN THE PHYTOPLANKTON OF LAKE KINNERET, ISRAEL, 1972-1975,
Israel Oceanographic and Limnological Research Ltd., Haifa.
U. Pollingher, and T. Berman.
Oikos, Vol. 29, No. 3, p 418-428, 1977. 7 fig, 5 tab, 28 ref.

Descriptors: *Lake Kinneret(Israel), *Phytoplankton, *Peridinium cintum westii, *Succession, *Photosynthesis, *Standing crops, Seasonal, Israel, Lakes, Algae, Chlorophyll, Eutrophication, Biomass, Chloropyta, Cyanophyta, Species composition, Primary productivity, Droughts, Detritus, Food webs, Zooplankton, Nutrients, Metabolism,

Water level fluctuations, Water supply, Dinoflagellates.

Nutrients or factors other than light limited phytoplankton growth and resulted in a dramatic decline in the standing crop of the boom dinoflagellate peridinium cinctum fa. westii between 1972-75 in Lake Kinneret, Israel. Changes observed during weekly and biweekly sampling suggest a trend away from a detrital food web dominated by Peridinium to a pattern of greater zooplankton grazin. Between 1972-75 algal standing crop declined from an annual average of 80.5 g/sq m to 40 g/sq m. The change was paticularly evident during the Peridinium bloom period, and was caused by a decrease both in cell number and size. The relative proportion of small Chlorophyta and Cyanophyta increased over the period, with cyanophyte increase especially notable in late summer and fall. Chlorophyll concentration did not correspondingly decrease, however, because of a general increase in cellular chlorophyll content F. Primary production likewise did not decline, despite the fall off in algal biomass as fresh weight, because of the shigt to more rapidly metabolizing species. As a result, assimilation numbers, turnover times, and algal growth rates were higher than between 1969-72. Lake Kinneret, the only freshwater lake in Israel, serves as the principle reservoir for the national water supply system, and is classified as relatively eutrophic. During the study period a sereis of dry winters, beginning with the drought of 1972-73, resulted in low fall water levels and changes in hydromechanics and water chemistry. (Lynch-Wisconsing)
W79-01198

ROLE OF TURBULENT MIXING IN THE DISPERSION OF POLLUTANTS AT THE EDGE OF A LARGE LAKE,
Wisconsin Univ., Madison. Dept. of Meteorology.
R. J. Dobosy, and D. D. Houghton.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 383, Price codes: A09 in paper copy, A01 in microfiche. Final Project Report, March 1977. 161 p, 22 fig, 3 tab, 42 ref. NOAA 04-4-022-33, NSF ATM 75-03617.

Descriptors: *Shores, *Simulation analysis, *Turbulence, *Mixing, *Air pollution, *Dispersion, *Lake Michigan, Fallout, Model studies, Waukegan(IL), Illinois, Great Lakes, Lakes, Fumigation, Mathematical models, Equations, Pollutants, Water pollution sources, Air-water interfaces, Lake breezes, Winds, Air circulation, Plumes, Nearshore zone, Diffusion.

Dispersion of contaminants in the nearshore of Lake Michigan was investigated using numerical solution of budget equations for mass, momentum, and potential temperature. Wind and stability patterns, and turbulent mixing, were simulated as dispersants in a two-dimensional vertical plane model, with shoreline fumigation as the regime. Turbulence was simulated using schemes from levels two and three of the hierarchy of Mellor and Yamada. Turbulence simulation with a one-dimensional model using level three (which includes nonlocal effects) was verified with data from day 34 of the Wangara expedition. Difficulties encountered in data agreement appeared due to atmospheric processes such as horizontal advection not well simulated by the one-dimensional model. Data from offshore of Waukegan, Illinois for 28 June 1974 were used to compare levels two and three. Predicted mixed layer depth over land was much less than observed at Waukegan using either turbulence scheme, due apparently to three-dimensional features of the actual situation, not to inadequacies of the simulation. Predictions from level two, a simpler and purely local scheme, were comparable to level three for both pollutant concentration and mixed layer depth with winds of about three m/s, except within 500 m of the shore and a short distance above the inversion base. Level three was preferable, however, because of its greater generality and smoother predicted fields. (Lynch-Wisconsin)
W79-01199

PERSISTENT BLOOMS OF SURF DIATOMS ALONG THE NORTHWEST COAST,
Washington Univ., Seattle. Dept. of Oceanography.
J. Lewin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 373, Price codes: A02 in paper copy, A01 in microfiche. Sea Grant Reprint No. WSG-TA 77-3, presented to Oregon State University Symposium on 'The Marine Plant Biomass of the Pacific Northwest Coast', March 1977. 21 p, 8 fig, 13 ref. NSF-OCE-76-20155.

Descriptors: *Pacific Northwest U.S., *Nutrients, *Surf diatoms, *Eutrophication, *Aquiculture, *Pacific Coast Region, *Chaetoceros armatum, *Asterionella socialis, *Beneficial use, Surf, Diatoms, Coasts, Oceans, Algae, Phytoplankton, Washington, Oregon, Razor clams, Clams, Nitrates, Limiting factors, Salinity, Water temperature, Beaches.

Along parts of the Washington-Oregon Pacific coastline where sandy beaches predominate (especially between Tillamook Head, Oregon, and Grenville, Washington), algal populations are dominated by surf diatoms. These diatoms, at present mostly Chaetoceros armatum, a centric diatom, and Asterionella socialis, a pennate diatom, constitute a high algal biomass with a rapid growth rate which could provide a living food supply for aquaculture of bivalve molluscs such as razor clams. Razor clam and surf diatom abundance coincide along the beaches, and clam gut contents are composed almost entirely of the two diatom species. Razor clams in turn recycle nutrients needed by the diatoms, including the major source of regenerated nitrogen, ammonium. Surf diatom blooms are notable for two unique features: (1) the blooms are composed of only two significant species, and (2) blooms are persistent, and are usually present and most abundant throughout autumn-early spring, and less dense or absent during summer, in contrast to other phytoplankters or seaweed. Surf diatom populations have been monitored at Copalis Beach, Washington 1971-76. While neither phosphate nor silicate are limiting during summer, nitrate is depleted in surf samples by late April due to spring phytoplankton blooms (especially Thalassiosira pacifica) in upper inshore waters beyond the breaker zone. Nitrate reintroduction depends on upwelling and river drainage. (Lynch-Wisconsin)
W79-01200

TRANSFORMATIONS OF HEAVY METALS AND PLANT NUTRIENTS IN DREDGED SEDIMENTS AS AFFECTED BY OXIDATION REDUCTION POTENTIAL AND PH, VOLUME II: MATERIALS AND METHODS/RESULTS AND DISCUSSION,
Louisiana Agricultural Experiment Station, Baton Rouge.
R. P. Gambrell, R. A. Khalid, M. G. Verloo, and W. H. Patrick, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A041 469, Price codes: A07 in paper copy, A01 in microfiche. Contract Report D-77-4, Army Engineers Waterway Experiment Station, Vicksburg, Mississippi, May 1977. 309 p, 92 fig, 29 tab, 75 ref, 17 append. DACW39-74-C-0076.

Descriptors: *Gulf of Mexico, *Heavy metals, *Nutrients, *Oxidation-reduction potential, *Hydrogen ion concentration, *Dredging, *Sediments, *Dredge spoils, *Waste disposal, *Gulf Coast, Plant growth, Sediments, Rivers, Bays, Mercury, Lead, Cadmium, Zinc, Copper, Manganese, Iron, Phosphorus, Ammonium.

The chemical form and distribution of various trace metallic elements are all differently influenced by pH and oxidation-reduction (redox) potential in coastal Gulf of Mexico dredged sediments. One study determined how pH and redox changes during dredging and disposal affects chemical availability of mercury, lead, cadmium and other elements as plant nutrients and sediment toxins. A second study measured pH and redox effects on sediment capacity to retain high levels of added toxic materials. Mercury was not greatly influenced by pH change and redox intensity except under strongly reduced acidity and oxidized mild alkalinity. Lead was affected less by redox than pH, but was strongly associated with the reducible phase (hydrous oxides) and recovered in this form with increasing redox. Unlike mercury and lead, cadium release was favored by redox, particularly at pH 5.0 and 6.5. Dredged material dumped in open water undergo little redox change before they settle to the bottom and again become reduced sediment materials. But where dredging wastes are disposed upland, gradual drainage and subsequent oxidation may occur over time with changes in pH mediated by redox potential affecting metal availability. Affects of pH and redox on the hydrochemistry of iron, manganese, zinc, copper, phosphorus and ammonium-nitrogen are also discussed. (Lynch-Wisconsin)
W79-01201

QUABOAG AND QUACUMQUASIT PONDS, WATER QUALITY STUDY, APRIL 1974-APRIL 1975,
Massachusetts Water Resources Commission, Westborough. Div. of Water Pollution Control.
E. W. Chesebrough, and A. J. Screpetis.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 757, Price codes: A04 in paper copy, A01 in microfiche. February 1976. 71 p, 15 fig, 13 tab, 35 ref, 2 append.

Descriptors: *Quaboag Pond(MA), *Quacumquasis Pond(MA), *Eutrophication, *Waste water disposal, *Trophic level, Nutrients, Massachusetts, Limnology, Ponds, Water temperature, Dissolved oxygen, Water pollution effects, Primary productivity, Phytoplankton, Algae, Limiting factors, Depth, Macrophytes, Zooplankton.

Despite adequate nutrient concentrations in Quaboag Pond, phytoplakton production is extremely low and aquatic macrophytes are sparse; nearby Quacumquasit Pond is early-mesotrophic, with some evidence of eutrophication in the form of late summer bottom anaerobicity and summer presence of cyanophytes, but surface waters are clear and of good quality. Quaboag Pond water is likewise of good quality, except for high color content. Possible uptake of a micronutrient by macrophytes in the East Brookfield River may account for low productivity in Quaboag Pond. A wastewater treatment plant is located 4.5 miles upstream of the pond on a tributary of the river. Water quality data indicate neither phosphorus nor nitrogen is a limiting nutrient in Quaboag Pond. The two ponds are connected by a short stream which normaly flows from Quacumquasit to Quaboag Pond, but which during high water has been observed to reverse itself. Though Quaboag Pond has more than twice the area of Quacumquasit (531 vs 218 acres), the latter is far deeper (5.9 vs 32.5 ft mena depth). Quacumquasit Pond suports greater diversity and relative abundance of phytoplankton and zooplakton than does Quaboag. Heavy macrophyte growth, espcially water marigold, on the connector stream may act as a buffer in removing nutrients. (Lynch-Wisconsin)
W79-01202

ADDITIONS TO THE FRESHWATER ALGAE OF SOUTH CAROLINA,
Charleston Coll., SC.; and South Carolina Wildlife and Marine Resources Dept., Charleston.
A. K. Goldstein, and J. J. Manzi.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 193, Price codes: A02 in paper copy, A01 in microfiche. Journal of the Elish Mitchell Scientific Society, Vol 92, No 1, Spring 1976, p 9-13. 15 ref.

Descriptors: *South Carolina, *Algae, *Ponds, *Floral lists, *Phytoplankton, *Periphyton, Prawns, Macrobrachium rosenbergii, Aquiculture, Fish farming, Benthic flora, Chlorophyta, Chrysophyta, Cyanophyta, Euglenophyta, Pyrrophyta, Rhodophyta, Classification.

A survey of algal flora in two fish culture ponds in South Carolina used for grow-out of the giant freshwater prawn, Macrobrachium rosenbergii, conducted May-November 1975 resulted in identification of 259 taxa, among which 112 spcies and 19 genera are believed to be new records for the state. The ponds studied were: (1) a small (0.015 ha), shallow (0.25-1.0 m deep), relatively old pond with well-established vascular flora lining sides and bottom, located 180 km from the coast in the piedmont at the Styx Hatchery, Cayce, Lexington County; and (2) a larger (0.2 ha), shallow (0.-1.7 m deep), Relatively new pond with little vascular flora, located about 50 km inland at the Dennis Wildlife Center, Bolnneau, Berkeley County. Samples were collected semi-monthly for phytoplankton and periphyton, the latter by means of slides submerged in the shallow, mid-depth, and deep ends of each pond. Of the 259 taxa identified, 146 were Cholorphyta, 46 Cyanophyta, 45 Chrysophyta, 1 Pyrrophyta, nine Euglenophyta, and one Rhodophyta. Numerous Cryptophytes of the genus Cryptomonas were noted, but none were identified to species. Among Chrysophyta, 38 species were in the class Bacillariophyceae, four in Xanthophyceae, and three in Chrysophyceae. A complete list of all taxa is given. (Lynch-Wisconsin)
W79-01203

POLYHALOGENATED 1-OCTENE-3-ONES, ANTIBACTERIAL METABOLITES FROM THE RED SEAWEED BONNEMAISONIA ASPARAGOIDES,
Scripps Institution of Oceanography, La Jolla, CA.
O. J. McConnel, and W. Fenical.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 818, Price codes: A02 in paper copy, A01 in microfiche. Tetrahedron Letters, 1977, No. 2, p 1851-1854. 1 tab, 8 ref. SG-04-3-158-22.

Descriptors: *Bonnemaisonia asparagoides, *Antibacterial substances, *Seaweeds, *Bacteria, *Staphylococcus auresus, *Polyhalogenated 1-octene-3-ones, Metabolites, Algae, Delisea fimbriata, Ptilonia australasica, Sea grasses, Biochemistry, Metabolism, Spain, Mediterranean Sea, Seas, Acetates, Halogens.

Extracts of the red seaweed Bonnemaisonia asparagoides do not contain polyhalogenated 2-heptanones as expected, but instead contain five closely related bromine- and chlorine-containing 1-octene-3-ones. Each shows significant antibacterial activity toward Staphylococcus auresus. Specimens of B. asparagoides were collected along the Mediterranean coast near La Escala, Spain. The polyhalogenated 1-octene-3-ones reported here, and those recently isolated from two Australian relatives of B. asparagoides (Delisea fimbriata and Ptilonia australasica), as well as the Delisea C9 lactones, have a common origin in acetate-derived precursors. Polyhalogenated nona-2,4-diones (with hydroxylation at C-6 for some of the lactones) undergo base-induced Favorsky reactions presumable analogous to reactions of haloacetones found in Asparagopsis sp. Favorsky reactions involving the C-2 carbonyl could, following decarboxylation and concommitant halogenation, yield the halo 1-octene-3 ones. Reactions involving the C-4 carbonyl could yield a C-4 carboxylate substituted n-octane skeleton which, through enolization of the remaining carbonyl toward C-1, could cyclize to give the Delisea lactones. It had been expected that the biologically active components in B. asparagoides would be related to the polyhalogenated 2- heptanones isolated from B. hamifera collected in the Gulf of California. (Lynch-Wisconsin)
W79-01204

WASTE SOURCE INVESTIGATIONS, KINGSPORT, TENNESSEE.
National Field Investigations Center-Denver, CO.; and Environmental Protection Agency, Atlanta, GA. Region IV.
For primary bibliographic entry see Field 5B.
W79-01208

THE OKEFENOKEE SWAMP WATERSHED: WATER BALANCE AND NUTRIENT BUDGETS,
Georgia Univ., Athens. Dept. of Zoology; and Georgia Univ., Athens. Inst. of Ecology.
For primary bibliographic entry see Field 2H.
W79-01211

NITROGEN ACCRETION, AND THE NATURE AND POSSIBLE SIGNIFICANCE OF N2 FIXATION (ACETYLENE REDUCTION) IN A NOVA SCOTIAN SPARTINA ALTERNIFLORA STAND,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Biology.
D. G. Patriquin, and C. R. McClung.
Marine Biology, Vol. 47, p 227-242, 1978. 11 fig, 3 tab, 52 ref.

Descriptors: *Salt marsh, *Nitrogen fixation, *Soil bacteria, Wetlands, Marshes, Anaerobic bacteria, Bacteria, Nitrogen, Rhizosphere, Marsh plants, Nova Scotia(Canada).

Total aboveground nitrogen accretion at a short Spartina alterniflora stand was estimated as 78 kg N/ha, compared to estimated N2 fixation on the mud surface of 22 kg N/ha, and subsurface N2 fixation of 93 kg N/ha. Subsurface N accretion was estimated to be of the order of 77 kg n/ha. Mudsurface ARA (acetylene-reducing activity) exhibited a pronounced mid-season maximum, while subsurface ARA exhibited a general trend of increase from May to September, and then a decline as a function of falling temperature. Various experiments suggest that mud-surface ARA was associated with non-heterocystous blue-green algae and photosynthetic bacteria, while subsurface ARA was associated with vital activity of S. alterniflora. Counts of various groups of bacteria indicated an enrichment of anaerobic and microaerophilic N2-fixing bacteria in the rhizosphere in comparison to non-rhizosphere soil. Root treatment with chloramine-t reduced total numbers of anaerobic and microaerophilic N2 fixers suggesting a relative enrichment of microaerophiles in the interior or 'endorhizosphere' of the roots. (Steiner-Mass)
W79-01214

THE INFLUENCE OF COLLOIDAL ORGANIC MATTER ON IRON AND IRON-PHOSPHORUS CYCLING IN AN ACID BOG LAKE,
Michigan Univ., Ann Arbor. School of Natural Resources.
J. P. Koenings, and F. F. Hooper.
Limnology and Oceanography, Vol. 21, No. 5, p 684-696, September, 1976. 5 fig, 4 tab, 20 ref.

Descriptors: *Bogs, *Iron, *Phosphorus, *Organic matter, Wetlands, Michigan, Organic compounds, Anaerobic conditions, Organophosphorus compounds, *Colloidal organic matter, *Biologically active metals, Ferrous iron, Acid by lakes, North Gate Lake(Michigan).

The relationship between iron and phosphorus and the relationship of those elements of colloidal organic matter (COM) was studied in a meromictic acid lake. Bathophen anthroline (BPN) reactive ferrous iron existed in true solution, dialyzable, in constantly anaerobic monimolimnetic water; in the aerobic epilimnion reactive ferrid iron was of colloidal size. Intermediate depths, oxygenated only during spring, contained two forms of ferrous iron reactive to BNP: dialyzable ferrous iron (Fe(2+)) and colloidal Fe (II) which may have originated through in situ reduction of colloidal reactive ferric iron and may be present as a COM-Fe (2+) complex. The amount of COM influenced the fate of dialyzable Fe (2+) and dialyzable PO sub 4-P present in anaerobic strate before aeration. Aeration with soluble organic matter present (COM absent) resulted in the formation of colloidal nonreactive ferric iron and 65% colloidal PO sub 4-P while aeration with 26 mg/liter COM resulted in only 36% colloidal, nonreactive ferric iron and 19% colloidal PO sub 4-P. COM apparently masks the cationic properties of colloidal ferric iron and retards the formation of nonreactive Fe (III), allowing most of the PO sub 4-P to remain free in solution and biologically available. (Steiner-Mass)
W79-01219

INJURIOUS EFFECT OF TAP WATER ON ROOTING OF CUTTINGS OF BRYOPHYLLUM CALYCINUM,
Rockefeller Univ., New York.
W. J. Robbins, and A. Hervey.
Bull Torrey Bot Club. 99(5), p 248-249, 1972.

Descriptors: *Potable water, *Bryophyllum-calycinum, *Chlorine, *Copper, Cuttings, *Fluorine, Injurious, *Roots, *Toxicity, Water pollution effects.

Cuttings of B. calycinum root well in distilled water but poorly, if at all, in New York City tap water. Results of experiments suggest that Cu in New York City tap water is the main cause of its toxicity, but other substances including Cl, F and volatile or thermolabile materials may play a role.--Copyright 1973, Biological Abstracts, Inc.
W79-01221

PRODUCTION AND DYNAMICS OF EXPERIMENTALLY ENRICHED SALT MARSH VEGETATION: BELOWGROUND BIOMASS,
Marine Biological Lab., Woods Hold, MA. Boston Univ. Marine Program.
I. Valiela, J. M. Teal, and N. Y. Persson.
Limnology and Oceanography, Vol. 21, No. 2, p 345-252, March, 1976. 3 fig, 2 tab, 28 ref.

Descriptors: *Productivity, *Salt marshes, *Vegetation, Marshes, Vegetation, Rooted aquatic plants, Roots, Rhizomes, Root development, Standing crops, Biomass, Fertilizers, Nutrients, Spartina alterniflora, Spartina patens.

Root growth increased during the early growing season in Spartina alterniflora salt marsh plots. While fertilization with nitrogenous fertilizer did not affect initial growth, a marked decrease in root biomass followed the spring peak particularly where nutrient doses were highest. A sharp reduction in roots occurred in enriched areas covered by S. patens, although, as with S. alterniflora, aboveground biomass increased. Root disappeared during autumn leaving only rhizomes to overwinter. Maximum standing crop for roots was 0-2 cm deep, for rhizomes 2-5 cm. Net annual underground production was calculated from annual increments in dead matter belowground. Total production, underground and aboveground, exceeds that of any marine vegetation, ranging from 3,900 to 6,600 g/sq m/yr in S. alterniflora areas and 3,200 to 6,200 g/sq m/yr in S. patens areas. Fertilization increased production aboveground where deal plant parts are subject to export. (Maroncelli-Mass)
W79-01222

PRIMARY PRODUCTION IN A SHALLOW WATER LAKE WITH SPECIAL REFERENCE TO A REED SWAMP,
Odense Univ. (Denmark). Biological Inst.
F. O. Anderson.
Oikos, Vol. 27, p 243-250, 1976. 10 fig, 7 tab, 26 ref.

Descriptors: *Lakes, *Primary productivity, *Aquatic plants, Wetlands, Swamps, Aerial photography, Phytoplankton, Submerged plants, Eutrophication.

Phytoplankton gross primary productivity in the shallow, eutrophic Danish Lake Arreso was 980 g C per sq m. Calculated net primary production was near zero. Macrophyte net primary production was measured by harvesting the maximum biomass, and above ground values were between 420 and 1325 g ash free dry wt per sq m, while below ground values were between 2480 and 8570 g ash free dry wt per sq m. The reed swamps were mapped on aerial photographs, and the composition of the macrophyte vegetation was determined. A comparison of macrophyte vegetation in 1944 and 1972 showed a reduction in species diversity,

especially of submerged species. The seasonal variations in physical and chemical data indicated strong eutrophication. (Steiner-Mass)
W79-01223

NITROGEN AND PHOSPHORUS FERTILIZATION OF AQUATIC VASCULAR PLANTS AND ALGAE IN REPLICATED PONDS. I. INITIAL RESPONSE TO FERTILIZATION,
Lawler, Matusky and Skelly, Tappan, NY; and Cornell Univ., Ithaca, NY.
H. F. Mulligan, A. Baranowski, and R. Johnson.
Hydrobiologia, Vol. 48, No. 2, p 109-116, February 29, 1976. 8 fig, 3 tab, 14 ref.

Descriptors: *Submerged plants, *Nitrogen, *Phosphorus, *Effects, Nutrient, Rooted aquatic plants, Benthic flora, Standing crops, Phytoplankton, Hydrogen concentration, New York, Ponds, Wetlands.

Populations of common submerged vascular plants were established in a series of 18 experimental ponds in 1967 and subjected to a replicated inorganic N-P fertilization program. The 18 ponds were fertilized as follows in 1968: 6 unfertilized controls, 6 low fertility (.75 mg P/l) and 6 high fertility (75 mg N/l, 7.5 mg P/l). The high fertility levels tended to eliminate the benthic plant populations and increase the phytoplankton standing crops. Elodea canadensis grew in the highest nutrient levels by Myriophyllum spicatum var. exalbescens and Ceratophyllum demersum appeared to be eliminated. Potamogeton crispus produced an abundance of winter buds under conditions of high fertility. There were no obvious differences in the benthic plant and phytoplankton populations among the control and low fertility ponds. (Stihler-Mass)
W79-01224

RESPONSE IN PRODUCTION OF CORD GRASS, SPARTINA ALTERNIFLORA, TO INORGANIC NITROGEN AND PHOSPHORUS FERTILIZER,
Delaware Univ., Newark. Dept. of Biological Sciences.
For primary bibliographic entry see Field 2L.
W79-01225

EFFECT OF SOIL APPLICATION OF DAIRY MANURE ON GERMINATION AND EMERGENCE OF SOME SELECTED CROPS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
D. C. Adriano, A. C. Chang, P. F. Pratt, and R. Sharpless.
Journal of Environmental Quality, Vol. 2, No. 3, p 396-399 July-Sept. 1973. 2 fig, 3 tab, 12 ref. (California Water Resources Center Project UCAL-WRC-W-363).

Descriptors: *Salt injury, Toxicity, Manure decomposition, Plant growth, *Farm wastes, *Waste disposal, *Germination.

Germination and emergence of sudangrass (Sorghum sudanense Stapf 'Piper'), barley (Hordeum vulgare L. 'Numar'), radish (Raphanus sativus L. 'Cherry Belle'), and spinach (Spinacea oleracea L. 'Bloomsdale') in a glasshouse were investigated using a Chino loam soil where various amounts (0, 5, 10, 15, and 20% dry manure by weight) of dairy manure were added. The degree of germination injury depended on the crop species and rate of application or of salt and N inputs. The crop sensitivity to salt or NH3 were as follows: barley < sudangrass and spinach < radish. Barley and sudangrass were more tolerant to salt or NH3 than spinach and radish. Barley germination data from treatments which had NaCl added to the soil extracts to obtain the same osmotic potential as those treated with urine, urea, or manure suggest that the germination injury was not salt specific and that other compounds such as NH3 were also contributing factors. Germination injury can be minimized by planting several days after soil application of large amounts of dairy or feedlot manure to allow volatilization of a significant quantity of NH3 or after adequate preirrigation, or both. (Snyder-Calif, Davis)
W79-01236

YIELD AND CADMIUM ACCUMULATION OF FORAGE SPECIES IN RELATION TO CADMIUM CONTENT OF SLUDGE-AMENDED SOIL,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
F. T. Bingham, A. L. Page, R. J. Mahler, and T. J. Ganje.
Journal of Environmental Quality, Vol. 5, No. 1, p 57-60, 1976. 5 fig, 1 tab, 19 ref. (California Water Resources Center Project UCAL-WRC-W-420).

Descriptors: Sludge, *Sludge treatment, Environmental effects, Soil chemical properties, *Cadmium, Heavy metals, Toxicity, *Soil contamination effects.

Alfalfa (Medicago sativa L.), white clover (Trifolium repens L.), sudangrass (Sorghum halepense Pers var. Sudanense Hitche.), tall fescue (Festuca elatior L.), and bermudagrass (Cynodon dactylon Pers.) were grown in pot cultures under greenhouse conditions to study the effect of soil Cd levels on Cd uptake and yield. The substrate consisted of a soil (pH 7.5) pretreated with 1% municipal sewage sludge amended with variable amounts of CdSO4. Concentrations of Cd in soil varied from 0.09 (control) to 160 microgram Cd/g soil. Yields of dry matter (70C) were obtained by clipping off the shoots at early bloom stage. Samples of the clippings were analyzed for Cd and Zn. Soil was analyzed after the plant growth experiments were completed. Substrate Cd concentrations of 15, 30, 40, 95, and 145 microgram Cd/g were associated with a 25% yield depression for sudangrass, alfalfa, clover, fescue, and bermudagrass. Corresponding Cd concentrations of clippings were 9, 24, 17, 37, and 43 microgram Cd/g. The soil analysis revealed a close agreement between both DTPA-Cd and saturation extract Cd and Cd uptake and crop yield data. Chemical analysis of saturation extracts showed an inverse effect of Cd on the solubility of Zn. (Snyder-Calif, Davis)
W79-01237

EFFECTS OF KELTHANE AND TEMPERATURE ON THE RESPIRATION OF CRANGON FRANCISCORUM,
California Univ., Davis. Dept. of Land, Air and Water Resources.
J. W. Sharp, R. M. Sitts, and A. W. Knight.
Comparative Biochemistry, Physiology, Vol. 50C, 1978, p 75-79. (California Water Resources Center Project UCAL-WRC-W-243).

Descriptors: *Bioassay, *Shrimp, *Temperature, *Insecticides, California, *Kelthane, *Respiration, Water pollution effects, Chlorniated hydrocarbon pesticides, Estuaries, San Francisco Bay(Calif).

The effects of temperature and the chlorinated hydrocarbon pesticide Kelthane on the respiration of the adult estuarine shrimp Crangon franciscorum, Stimpson were determined. C. franciscorum respiration was determined after 48 hr of acclimation and 96 hr of exposure to six Kelthane concentrations (843, 475, 208, 130, 89 and O microgram/l) at each of three temperatures (16.0 degrees C, 19.0 degrees C and 23.8 degrees C). C franciscorum is a partial metabolic regulator over the temperature range tested. All Kelthane exposure levels depressed oxygen consumption below control rates. (Snyder-Calif Davis)
W79-01241

EFFECT OF ACID MINE DRAINAGE ON THE PH OF LAKE TOYA, JAPAN,
Toyama Univ. (Japan). Faculty of Science.
For primary bibliographic entry see Field 5B.
W79-01258

THE IMPORTANCE OF WATER FOR THE SPREAD OF POTENTIALLY PATHOGENIC MYCOBACTERIA: II. GROWTH OF MYCOBACTERIA IN WATER MODELS, (IN GERMAN),
Forschungsinstitut, Borstel (West Germany). Inst. fuer Experimentelle Biologie und Medizin.
J. Kazda.
Zentralbl Bakteriol Parasitenkd Infektionskr Hyg Erste Abt Orig Reihe B Hyg Praev Med. 158(2), p 170-176, 1973.

Descriptors: Acidity, Ecology, Growth rates, Lettuce, Model studies, *Mycobacteria, Mycobacterium-avium, Mycobacterium-intracellulare, *Pathogenic bacteria, Temperature, *Water pollution effects.

In water models kept at 30C, growth of Mycobacterium intracellulare serotyoe Davis and M. avium serotype 2 occurred only in 'moorland' water, (pH range 4.2-4.7) (maximum values after 21 days 10 to the 4th power and 10 to the 5th power/ml, respectively). In 2 other 'model' waters (pH values of 7.3-8.3 and 6.9-9.1), no growth of these mycobacteria was observed. The number of water bacteria fell during the experiments in moorland water by 2 orders to 10 to the 3rd power, but in the other types of water they remained constant (10 to the 6th power/ml) or decreased slightly. From 1969-1971 a potentially pathogenic mycobacterium grew only once in a favorable weather period of 18 days (maximum mean daily temperature 29 + or - 2.7C, mean sunshire 10.7 + or - 2.8 h, no ran). After watering lettuce plants with a suspension of serotype Davis (0.1 mg/ml), the mycobacteria lodge, in spite of frequent washing, in the protective crevices of the leaves; entry into the plants themselves was not demonstrated. The close association between the ecology and epidemiology of potentially pathogenic mycobacteria is discussed.--Copyright 1975, Biological Abstracts, Inc.
W79-01259

HIGHWAY CONSTRUCTION IMPACT ON WATER-SUPPLY LAKES,
Interprovincial Engineering Ltd., Halifax (Nova Scotia).
For primary bibliographic entry see Field 4C.
W79-01260

GROWTH AND CADMIUM ACCUMULATION OF PLANTS GROWN ON A SOIL TREATED WITH A CADMIUM-ENRICHED SEWAGE SLUDGE,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
F. T. Bingham, A. L. Page, R. J. Mahler, and T. J. Ganje.
Journal of Environmental Quality, No 2, Vol 4, p 207-211, 1975, 3 fig, 3 tab, 17 ref. (California Water Resources Center Project UCAL-WRC-W-420).

Descriptors: *Sewage sludge, *Sludge disposal, *Cadmium, Plant growth, Plant growth regulators, Chemicals.

Corn, wheat, rice, field bean, soybean, cabbage, spinach, lettuce, curlycress, carrot, turnip, radish, tomato, and squash plants were grown to commercial harvest stage using as the substrate, soil pretreated with a municipal sewage sludge (1%) containing variable amounts of CdSO4 up to 640 micrograms Cd/g soil. Observations included injury symptoms, yield decrement, Cd level of diagnostic tissue, and Cd and Zn content of harvested produce. Cadmium-sensitive plants such as spinach, soybean, curlycress, and lettuce were injured by soil Cd levels of 4-13 microgram Cd/g soil; whereas, tomato and cabbage tolerated soil levels of approximately 170 micrograms Cd/g soil without exhibiting injury symptoms. Rice was tolerant at all levels tested. Leafy plants such as lettuce, spinach, and turnip greens (tops) accumulated 175 to 354 micrograms Cd/g; whereas, fruit and seed tissue of plants under comparable treatment, with the exception of soybean, accumulated no more than 10 to 15 microgram Cd/g tissue. The concentrations for soybean extended up to 30 micrograms Cd/g tissue. Paddy rice exhibited no ill effects for soil Cd treatments up to 640 micrograms CD/g soil. Grain of plants under the 640 micrograms Cd/g treatment contained 2 micrograms Cd/g tissue.

DPTA-extractable Cd correlated (r=0.99) with the level of CdSO4 added to the substrate. (Snyder-Calif, Davis)
W79-01282

THERMAL ALTERATIONS OF AQUATIC ECOSYSTEMS,
Savannah River Ecology Lab. Aiken, SC.
J. W. Gibbons, and R. R. Sharitz.
American Scientist, Vol. 62, No. 6, p 660-670, November-December, 1974. 11 fig, 35 ref.

Descriptors: *Thermal pollution, *Savannah River, Ecological distribution, Effects, Swamps, Species diversity, Pollution, *South Carolina, Temperatures, Invertebrates, Birds, Fish.

Heated effluents released by the U.S. Atomic Energy Commission's Sabannah River Plant in South Carolina may function to enrich or to stress an ecosystem, depending on the biological feature examined. A gradient in temperature was encountered progressing downstream or across a pond or swamp from the source of thermal pollution. Elimination of some species occurred at the extreme high temperature level with no subsequent replacement. Depending on sensitivity, species were reduced or eliminated throughout the temperature gradient. Species diversity and evenness were decreased in some communities, but were maintained or even increased in others where resistant species moved in to fill available niches. Decreased species diversity and increased abundance of one or two dominant species also occurred under thermal stress. Phenomena associated with thermally affected aquatic communities includes accelerated growth rates of individuals and life history alterations. Recovery from heavy thermal loading was found to be slow and perhaps influenced by the proximity of other natural aquatic areas. (Howard-Mass)
W79-01284

SUSPENSION-FEEDING AQUACULTURE SYSTEMS: EFFECTS OF PHYTOPLANKTON CONCENTRATION AND TEMPERATURE ON GROWTH OF THE BAY SCALLOP,
Duke Univ., Beaufort, NC. Marine Lab.
W. W. Kirby-Smith, and R. T. Barber.
Aquaculture. 3(2), p 135-145, 1974.

Descriptors: *Aquaculture, Argopecten irradians, Feeding, *Growth rates, Mathematical models, *Phytoplankton, *Scallops, *Temperature.

The growth rate of the bay scallop Argopecten irradians was studied in relation to temperature and phytoplankton concentration. Normal variations in phytoplankton concentration probably do not influence the growth rate of scallops in their natural habitat. Increasing the concentration of phytoplankton above natural levels did not result in increased growth rates while decreasing the phytoplankton concentration resulted in a decrease in growth rate of the scallops. Under extremely low phytoplankton concentrations, such as those that characterize 'clean water' effluent from a culture syste, the animals ceased growing. A mathematical model of scallop growth rate as a function of phytoplankton concentration is proposed as a tool for comparing the functioning of different suspension feeders in aquaculture systems. Copyright 1975, Biological Abstracts, Inc.
W79-01285

FERTILIZING FISH PONDS: I. CHEMISTRY OF THE WATERS,
Alexandria Inst. Oceanography and Fisheries (Egypt).
S. D. Wahby.
Aquaculture. 3(3), p 245-259, 1974.

Descriptors: Fertilizers, *Fish ponds, *Nitrates, *Phosphates, *Water chemistry, *Fertilization.

Fertilization experiments were carried out in the Mex fish farm using superphosphate, ammonium nitrate and organic manure as fertilizers (to increase fish production). The water was analysed monthly for inorganic phosphates, nitrates and silicates, in addition to chlorosity and pH. The ponds fertilized with chemical fertilizers exhibited a more rapid consumption of nutrients than the pond fertilized with organic manure. Phosphates and nitrates disappeared from the ponds after about 2 days of addition.--Copyright 1975, Biological Abstracts, Inc.
W79-01286

EFFECT OF BEEF-FEEDLOT-LAGOON WATER ON SOIL CHEMICAL PROPERTIES AND GROWTH AND COMPOSITION OF CORN FORAGE,
Kansas State Univ., Manhattan. Dept. of Agronomy.
G. W. Wallingford, L. S. Murphy, W. L. Powers, and H. L. Manges.
J Environ Qual. 3(1), p 74-78, 1974.

Descriptors: Corn(Field), Crop production, *Feedlots, Fertility, Forage, Growth rates, Lagoons, Minerals, Nutrients, Salinity, Soils, *Farm wastes, Waste disposal, Water pollution effects.

Land disposal of beef-feedlot-lagoon (runoff) water was studied. Rates of 0, 8, 15, 26 and 46 cm/yr of lagoon water were applied during the summers of 1970 and 1971 by furrow irrigation to a silty clay loam soil. Corn (Zea mays L.) forage yield and plant content of N, P, K, Ca, Mg, and Na were measured. Surface soil samples and soil cores were taken from the plots after harvest each year. Electrical conductivity ranged 1.6-7.6 (3.1 average) mmho/cm in the lagoon water applied at the study site and from 1.0 to 12.8 mmho/cm in samples taken from 12 Kansas (USA) feedlots. Electrical conductivities of extracts from saturated pastes of the surface soil samples were increased linearly by accumulative treatment both years. The 1970 and 1971 soil cores showed accumulations of NO3-N, P, K, and Na in the top 30 cm at all treatment rates. Movement of NO3-N and Na down to 100 cm was noted in the 1971 cores from plots receiving 46 cm/yr. Ca and Mg in the soil cores were not affected by treatment either year. Corn forage yields were a linear function of treatment in 1970 and a quadratic function in 1971. The positive effect on yield both years was attributed to increased soil fertility; the relative decrease in 1971 at 26 and 46 cm/yr rates was attributed to increased soil salinity. Maximum yield and uptake of N and P were reached at the 15 cm/yr disposal rate in 1971. Copyright 1974, Biological Abstracts, Inc.
W79-01290

THE RESPONSE OF EMPETRUM NIGRUM L. TO DIFFERENT MIRE WATER REGIMES, WITH SPECIAL REFERENCE TO WYBUNBURY MOSS, CHESHIRE AND FEATHERBED MOSS, DERBYSHIRE,
Imperial Coll. of Science and Technology, London (England). Dept. of Botany.
J. N. B. Bell, and J. H. Tallis.
J Ecol. 62(1), p 73-95, 1974.

Descriptors: Adaptation, *Carbon dioxide, Cheshire, Climates, Derbyshire, *Empetrum nigrum, England, *Hydrogen sulfide, Mire, *Moss, *Oxygen depletion, Peat, Physiological studies, Rainfall, Roots, Water table, Wybunbury.

The decline and subsequent revival of the E. nigrum colony at Wybunbury Moss, Cheshire (England) between 1965 and 1968, were investigated and were shown to have coincided with a rise and fall respectively in the mean summer water table, resulting from rainfall variation and the condition of the main drainage channel from the mire. Field observations at Wybunbury Moss, Featherbed Moss and laboratory experiments showed that E. nigrum is adversely affected by prolonged waterlogging. In general, E. nigrum occurs on the drier parts of mire sites, although evidence presented suggests that there may be physiological adaptation in some places to different water regimes. At Wybunbury Moss the plants are adapted to relatively dry conditions and are thus particularly sensitive to a high water table. At Featherbed Moss E. nigrum is absent from regions with the highest CO2 partial pressures in the peat. At Wybunbury Moss high H2S and/or CO2 levels as well as an O2 deficiency in the substratum, resulting from the high water table, are considered to have damaged the roots. There is evidence that elevated Al concentrations in the mire water, accompanying the rise in water table, may have contributed to the decline of E. nigrum. Copyright 1974, Biological Abstracts, Inc.
W79-01293

PRIMARY PRODUCTION OF EDAPHIC ALGAL COMMUNITIES IN A DELAWARE SALT MARSH,
Delaware Univ., Newark. Dept. of Biological Sciences.
J. L. Gallagher, and F. C. Daiber.
Limnology and Oceanography, Vol 19, No 3, p 390-395, May, 1974. 4 fig, 2 tab, 10 ref.

Descriptors: *Salt marshes, *Soil algae, *Primary productivity, Wetlands, Marshes, Algae, Productivity, Delaware, Marsh plants.

Gross primary production of edaphic algae was estimated for five areas in a high salinity tidal marsh near Lewes, Delaware. Salt pan and bare bank (free of angiosperms) algal production did not vary significantly from one part of the year to another. Algal productivity in the tall Spartina alterniflora and Distichlis spicata areas was greatest from mid-January to mid-May. In the short S. alterniflora area, algal productivity did not decrease in the warmest part of the year as it did in the two other grass areas. Annual cycles of light, temperature, and salinity were measured. Gross algal production was about a third of the angiosperm net production. Since much of the algal production occurs when angiosperms are dormant, it complements the pattern of angiosperm energy fixation. (Steiner-Mass)
W79-01296

TRENDS IN THE ABUNDANCE OF AMERICAN SHAD, ALOSA SAPIDISSIMA, IN THE DELAWARE RIVER BASIN,
Texas A and M Univ., College Station. Dept. of Wildlife and Fisheries Sciences.
M. E. Chittenden, Jr.
Chesapeake Sci. 15(2), p 96-103, 1974.

Descriptors: Alosa-sapidissima, *American shad, Bays, *Delaware River Basin, River, Water pollution effects.

The American shad, A. sapidissima was abundant in the Delaware River Basin until 1901. Annual commercial landings from 1890-1901 (about 11-17 million lb) were several times grater than in any other river system. Abundance declined rapedly after 1901, except for a resurgence in 1907, which may be interpreted as evidence that by 1903 polution was affecting successful seaward movement of young produced in the Delaware Rivr. Less than 0.5 million lb were landed in 1920. Abundance had remained low since 1920, although fluctuations have occurred. Extra-Delaware basin fish mix with Delaware Basin fish at the more of Delaware Bay. It is not clear how far extra-Delaware Basin fish penetrate upbay, but they do not enter freshwater of the Delaware River. Records available for several years in the period 1890-1901 indicate that 39% of the total Delaware Basin landings came from freshwater of the Delaware River, suggesting that landings at that time were primarily dependent on Delaware Basin fish.--Copyrigh 1974, Biological Abstratcs, Inc.
W79-01322

PHOSPHORUS CYCLING IN NUPHAR LUTEUM COMMUNITIES IN THE LOWER CHOWAN RIVER, NORTH CAROLINA,
East Carolina Univ., Greenville. Dept. of Biology.
R. R. Twilley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 915, Price codes: A07 in paper copy, A01 in microfiche. MS Thesis, July 1976, 120 p 20 fig, 14 tab, 86 ref.

OWRT B-079-NC(5).

Descriptors: *Rooted aquatic plants, *Aquatic plants, *Aquatic weeds, *Plant growth, Aquatic productivity, Cycling nutrients, Chemical analysis, Nutrient removal, *Chowan River(NC), *North Carolina, *Aquatic macrophyte, *Yellow water lily.

This study evaluated the role of Nuphar luteum in the cycling of phosphorus (P) in the lower Chowan River. Measurements were made of (a) seasonal and spatial P concentrations in the plant, (b) fractions available to the plant in the substrate and (c) P flux between plant sediment, and overlying water. The P concentration in the aboveground biomass (leaves and petioles) peaked during early spring (241.57 g-jat P/g OW) while the rhizomes declined in P concentrations during this season. Rhizomes accumulated the greatest amount (66.2%) ofthe P bound in the biomas of Nuphar followed by roots (10.6%) with the remainder (7.1-8.1%) in the three aboveground structures. Total acumulation of P in the biomass of Nuphar during June in the lower Chowan River was 0.243 MT. At three sites, the biological available phosphorus concentration and the P concentration in the roots correlated better (r=0.90) than did interstitial water and root concentration (r=o74). Uptake translocation, and subsequent secretion of phosphours by Nuphar was studied under laboratory and field conditions using radioiostopes. In both laboratory and field experiments, translocation of P absorbed by roots occurred more rapidly and extensively than with submersed leaves and floating leaves. A bidirectional flux of P was measured in Nuphar and the dominant pathway was from below ground to aboveground structures. The flux of P between the aboveground and belowground structures varied between spring, winter, and summer and the translocation rates were affected more by the seasons than the absorption rates. (Kiger - North Carolina)
W79-01326

THE EFFECT OF SEVERAL PHYSICAL AND CHEMICAL FACTORS UPON THE DISTRIBUTION OF BENTHIC MACROINVERTEBRATES IN DUNHAM POND, CONNECTICUT,
Connecticut Univ., Storrs.
B. L. Pallotti.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 924, Price codes: A04 in paper copy, A01 in microfiche. 1976 62 p, 12 fig, 10 tab, 43 ref, 2 append. OWRT A-054-CONN(6), OWRT 14-31-0001-4007.

Descriptors: *Benthic fauna, *Invertebrates, *Distribution patterns, *Lakes, *Wetlands, Carbon dioxide, Oxygen, Optical properties, Littoral, Profundal zone, *Connecticut, *Macroinvertebrates, *Physical properties, Chemical properties, *Softwater lake, *Sphagnum-red maple bog, *Sediment particle size, *Sediment organic weight, Ponar dredge, Dunham Pond(Conn).

The distribution of benthic macroinvertebrates in Dunham Pond, a small (4.7 ha) soft water lake in Mansfield, Connecticut, was determined. Although shallow, Dunham Pond stratifies and maintains an anaerobic hypolimnion throughout the summer. Inflow is received from two streams entering from a Sphagnum-red maple bog to the north and woodland to the east. Monthly sampling at nine stations, covering the most diverse types of lake habitat, began in June 1975 and continued for one year. Replicate ponar dredge samples were taken from which species identifications were made. Carbon dioxide, oxygen, and conductivity, optical density, sediment particle size and sediment organic weight were determined. A total of 27 species of organisms was found, although only 10 species were present in continually significant numbers. All of the littoral organisms present were found in the greatest numbers at the site of the single outlet stream or woodland inlet and generally decreased towards the bog inlet. The profundal organisms followed the same general pattern of lessening numbers towards the bog inlet. This pattern of organism distribuion follows a trend seen in the physical and chemical parameters. This trend shows the wetland's influence to be greatest at the northern end of the lake and then diminish away from the bog inlet.
W79-01330

CHARACTERISTICS OF SMALL MAMMAL POPULATIONS IN FORESTED AND OLD FIELD HABITATS PRIOR TO EFFLUENT SPRAY IRRIGATION,
Pennsylvania State Univ., University Park.
J. D. Spring.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 948, Price codes: A04 in paper copy, A01 in microfiche. Master of Science thesis, November 1977. 60 p, 9 fig, 15 tab, 49 ref, 1 append. OWRT B-084-PA(1), 14-34-0001-6113.

Descriptors: *Waste water(Irrigation), *Sewage effluents, *Mammals, *Wildlife habitats, *Animal populations, Forests, Pennsylvania, *Renovation, *White-footed mice, *Meadow vole, Cropland, Vegetation analysis, Prespray site, Control site, Dense undergrowth.

This study was designed to (1) investigate the population characteristics of two small mammal species, the white-footed mouse and the meadow vole, (2) study the diversity of the small mammal communities in forests and old fields, and (3) analyze the plant composition of the old fields. Censusing of the small mammal populations was carried out during spring and fall 1976 and spring 1977 on prespray and control sites. Vegetational analysis was conducted during summer 1976. The mice on both the prespray and control sites increased significantly from spring 1976 to fall 1976 and then decreased from fall 1976 to spring 1977. The amplitude of fluctuation on the control site was far greater than on the prespray area. The larger amount of dense undergrowth on the control site probably made this area more suitable. Both meadow vole populations displayed a significant increase in population density from spring 1976 to fall 1976 with a subsequent decline by spring 1977. These populations showed tendencies for a population cycle with a periodicity of about two years. The control site was more suitable for them than the prespray area due to a high proportion of grasses in the plant community and greater coverage. (Sink-Penn State)
W79-01331

FATTY ACID COMPOSITION OF ORGANIC DETRITUS FROM SPARTINA ALTERNIFLORA,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
D. M. Schultz, and J. G. Quinn.
Estuarine Coastal Mar Sci. 1(2), p 177-190, 1973.

Descriptors: Decomposition, *Detritus, *Fatty-acid, Microbial degradation, Molecular structure, Organic matter, *Spartina-alterniflora, Tides, *Rhode Island, *Narragansett Bay(RI).

The fatty acid composition and concentration of the marsh grass S. alterniflora were determined monthly (Jan. to Dec., 1971) on samples of stems and leaves collected from Bissel Cove, Narragansett Bay, Rhode Island. Seasonal differences were found in both composition and concentration. The fatty acids present in suspended organic matter collected at the mouth of Bissel Cove during ebb and flood tide for the same period were also analyzed. Laboratory model studies involving the formation of suspended organic matter by the decomposition of S. alterniflora were investigated under aerobic and anaerobic conditions, using both organic solvent-extracted and non-extracted grass. Field model studies were also conducted on marsh grass decomposing in Bissel Cove, using both extracted and non-extracted grass. The fatty acid composition and concentration of suspended organic matter formed in the various model studies were similar to those found in the natural material and differed markedly from that of S. alterniflora. The total fatty acid concentration and the branched chain 15-C acids of both natural and model suspended matter gave higher values than those found in S. alterniflora. These branched chain acids appear to be the result of microbial activity and their high levels in the suspended organic matter, together with the fatty acid concentrations of the model studies using extracted marsh grass, indicate that micro-organisms are very important in the formation of the natural organic detritus.--Copyright 1974, Biological Abstracts, Inc.
W79-01332

ULTRASTRUCTURE OF THE BLUE-GREEN ALGA ANACYSTIS NIDULANS INFECTED WITH AS-1 VIRUS,
California Univ., Riverside. Dept. of Plant Pathology.
M. B. Barkley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 919, Price codes: A08 in paper copy, A01 in microfiche. PhD Dissertation, December 1976. 144 p, 20 fig, 6 tab, 138 ref, 6 append. (Water Resources Center Project UCAL-WRC-W-496). OWRT B-176-CAL(1).

Descriptors: *Cyanophyta, *Viruses, *Adsorption, Plant pathology, Cultivation, *Anacystis nidulans, *Plant viruses, Electron microscopy, Algae, *Ultrastructure(Virus infection).

Precise environmental conditions for culturing Anacystis nidulans IU 625 had to be defined before ultrastructural aspects of virus infection could be initiated. Host cells in a known physiological state could thus be harvested for determining the rate of virus adsorption and growth. Previously described methods for purifying cyanophages from lysates of inoculated host cultures were unsatisfactory. A new method was developed involving treatment of lysate with bentonite, concentration by evaporation, and density gradient centrifugation. Purified virus was free of cellular debris, homogeneous with respect to particle morphology, and highly infectious. Treatment of lysates with bentonite stabilized infectivity of the virus. Purified virus may be stored for prolonged periods of time at room temperature, but the medium in which it is stored is critical. Under conditions used for cultivation of the host and virus, adsorption of the virus to host cells was not a first order reaction. Attempts to improve the rate of adsorption were unsuccessful. Electron microscopic studies of the infection process indicated the peripheral photosynthetic membranes of the host are infrequently observed to curve inwards beginning at one hour post inoculation(HPI). The invagination response of the thylakoids occurs with greater frequency by two HPI and progressively increases throughout the infection cycle. (Snyder-Calif Davis)
W79-01334

DISSOLVED ORGANIC CARBON FLUXES IN THE SHETUCKET RIVER OF EASTERN CONNECTICUT, USA,
Conneticut Univ., Storrs. Inst. of Water Resources.
R. L. Klotz, and E. A. Matson.
Freshwater Biology, Vol. 8, p 347-355, 1978. 4 fig, 3 tab, 35 ref. OWRT A-052-CONN(19), 14-31-0001-3507.

Descriptors: *Lotic environment, *Connecticut, *Organic carbon, Dissolved solids, *Dissolved organic carbon fluxes, *Sewage treatment plant, Net uptake, Benthic heterotrophs, *Shetucket River(Conn).

Seasonal changes in dissolved organic carbon (DOC) concentrations were monitored biweekly for one year at seven stations in the Shetucket River watershed in eastern Connecticut, U.S.A. Nine monthly diurnal studies revealed 24 hour fluctuations of up to 53% of the seasonal range of 250 to 2200 micromoles DOC. Net DOC removal along a 1.9 km stretch below a secondary sewage treatment plant (activated sludge effluent diluted to a final average volume of 1.4% in the river) ranged from 0 to 1600 and averaged 68 + or - 64 mmol/sq m/day. Removal of DOC farther downstream could only be observed during a severe three-hour October storm when net uptake ranged from 16 to

92 mmol/sq m/hr, using upstream-downstream techniques. Oxygen respiration could account for about half of the net DOC removal during the October storm. Even though net uptake was somewhate greater than reported in other lotic studies, about 97% of the DOC potentially available to benthic heterotrophs was exported further downstream.
W79-01337

THE MICROBIAL ECOLOGY OF THE GREAT SALT LAKE NORTH ARM,
Utah State Univ., Logan. Dept. of Biology.
F. J. Post.
In: Desertic Terminal Lakes: Proceedings of the International Conference on Desertic Terminal Lakes, Weber State College, Ogden, Utah Deon C. Greer, Ed., Utah Water Research Laboratory. Publication Logan 1977. OWRT A-024-UTAH(3). 14-34-0001-6046.

Descriptors: Halobacteria, Halophilic bacteria, Brine fly, Brine shrimp, Terminal lake, Halophage, Microbiology, Organic matter, Bacteria, Algae, Nitrogen, *Utah, Saline lakes, Lakes, *Great Salt Lake, Utah, Dunaliella salina, Dunaliella viridis, Halobacterium.

The north arm of the Great Salt Lake is high in salts and high in organic matter as reflected in the large soluble organic nitrogen pool, with a very large number of halophilic bacteria, 70,000,000 or more per ml. Accompanying the bacteria and apparently dependent on them for ammonium ion are several algae, Dunaliella salina and D. viridis. The brine shrimp and brine fly larvae feed on the algae and possibly the bacteria as well. No nitrate or nitrite has been demonstrated in the lake or laboratory microcosms nor has any nitrogen fixation been demonstrated in any lake samples so far. A model of nitrogen and organismal interaction is described.
W79-01346

THE MICROBIAL ECOLOGY OF THE GREAT SALT LAKE,
Utah State Univ., Logan. Dept. of Biology.
J. Post.
Microbial Ecology Vol 3, p 143-165, 1977.

Descriptors: Terminal lakes, Halophilic bacteria, Protozoa, Dead Sea, Cycling nutrients, Bacteria, Algae, Saline lakes, Lakes, Biomass, *Great Salt Lake, *Utah, Dead Sea, Cycling nutrient, Artemia salina, Ephydra.

The Great Salt Lake is actually two lakes. A highly saline northern arm and a moderately saline southern arm separated by a semipermeable rock causeway. The lake, particularly the northern arm, has a massive accumulation of organic matter resulting from more than 100,000 years of productivity, cycling from a freshwater to a saline lake, plus the influence of human industry and agriculture in more recent times. The north arm planktonic and attached community consists principally of, in order of biomass: bacteria of at least two general, Halobacterium and Halococcus; two algae, Dunaliella salina na D. viridis; the brine shrimp, Artemia salina; and, two species of brine fly, Ephydra gracilis and E. hian and possibly one more species. The algae and the bacteria appear to depend on each other for nutrients. The bacteria use orgnic matter produced by the algae and the algae use ammonia produced by the bacteria and possibly the brine shrimp. The production of ammonia appears to be the rate-limiting step although there is no shortage of other forms of nitrogen in the north arm. Based on aquarium studies, the potential for biomass production of algae and bacteria is much higher than actually observed in the north arm, leading to the postulation of two additional factors controlling population; the grazing of the algae by invertebrates with the excretion of compounds rich in nitrogen, and the effect of a low habitat temperature and winter cold on the bacteria, reducing their metabolic activities to nearly zero.
W79-01347

CARBON AND NITROGEN TRANSFORMATIONS IN SOILS AMENDED WITH SEWAGE SLUDGE,
Purdue Univ., Lafayette, IN.
R. E. Terry.
Available from the National Technical Service, Springfield, VA 22161 as PB-288 945, Price codes: A09 in paper copy, A01 in microfiche. PhD Dissertation 1976, 163 p, 28 fig, 35 tab, 79 ref. OWRT B-066-IND(3).

Descriptors: *Sewage sludge, *Nitrification, *Soil amendments, Carbon, Nitrogen, Ammonia, Soil management, Soil properties, Organic matter soil moisture, Anaerobic conditions, Sludge treatment, *Nitrogen transformation, Soil characteristics, Land application, Mineralization, Clay content.

The objective was to determine the effects of soil characteristics, sludge managent procedures, and environmental conditions on the decomposition rate of sludge in soils and on nitrogen transformations in sludge amended soils. Synthetic sewage sludges were prepared by anerobically digesting mixtures of 14C- and 15N-labeled Candida utilis cells and inorganic salts. The prepared sludges were similar in composition to anaerobically-digested municipal sludges. A fraction of anaerobically-digested sludges decomposed rapidly when added to an aerobic soil; however, 55 to 80% was resistant to decomposition. Decomposition of sludge in soil increased the breakdown of native soil organic matter while nitrification rates were also faster in sludge-amended soils as compared to nonamended soils. Ammonia volatilization from sludge-amended soils was greatest under conditions of rapid drying of the soil-sludge mixture, high soil pH (7.5), and low clay content of soils. No loss of applied N was observed in samples where sludge was incorporated and where the sample did not lose moisture during incubation. (Wiersma-Purdue)
W79-01350

DISTRIBUTION OF BLUEGREEN ALGAE IN A MISSISSIPPI GULF COAST SALT MARSH,
Mississippi State Univ., Mississippi State. Dept. of Botany.
For primary bibliographic entry see Field 5B.
W79-01356

SEASONAL GROWTH AND DECOMPOSITION OF VALLISNERIA AMERICANA IN THE PAMLICO RIVER ESTUARY,
East Carolina Univ., Greenville. Dept. of Biology.
C. D. Zamuda.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 943, Price codes: A05 in paper copy, A01 in microfiche. MS Thesis, December 1976. 77 p, 14 fig, 10 tab, 63 ref. OWRT A-077-NC(10), 14-31-0001-5033.

Descriptors: *Aquatic plants, *Recycling, *Temperature, *Salinity, *Biomass, Estuaries, *Seasonal growth(Plants), Organic matter, Productivity, Growth rates, Growth stages, *Pamlico River Estuary(NC), *North Carolina, Plant decay, Plant density.

Seasonal rates of growth and production and of inorganic and organic matter losses were determined for Vallisneria americana Michx. in the Pamlico River estuary of North Carolina. A direct marking technique was utilized to measure in situ changes in biomass and leaf dynamics for plants from two dissimilar locations. The upriver study site was characterized by extensive plant beds and low salinities (0-5 0/00) while at the downriver site, plants were less dense and exposed to higher salinities (2-11 0/00). The mean rate of leaf elongation was 5.6 mm/day for both locations. Plants produced a new leaf on the seasonal average of every 9.9 days, with greater rates for the downriver plants (8.2 days) as compared to those upriver (11.6 days). The seasonal mean production value was 2.3 mg ODW (organic dry weight)/plant day, with values generally greater downriver. Plants were harvested seasonally and maintained submerged in nylon bags (mesh=1mm), with a littoral and midriver decay site at each station. Summer decay was rapid with as much as 70% of the organic matter lost within the first two weeks. Decay coefficients for spring and summer material (k= 19.5) were greater than winter material (k= 10.0). Newly harvested plants had maximum levels of inorganic nutrients in winter: N, 4.3% ODW; P, 0.6%; Ca, 0.5%; Mg, 0.4%; K, 3.7%; and Na, 2.3%. During decay N and P concentrations remained essentially constant or gradually increased on the basis of ODW remaining. Sodium and K levels fluctuated, with concentrations increasing in spring and decreasing throughout the other seasons. Calcium levels initially increased and then decreased while Mg concentrations remained constant except for a summer decline. (Kiger-North Carolina)
W79-01362

A SURVEY OF THE FRESHWATER MUSSELS (BIVALVIA: UNIONIDAE) OF THE KANAWHA RIVER OF WEST VIRGINIA,
Marshall Univ., Huntington, WV. Dept. of Biological Sciences.
J. S. Morris, and R. W. Taylor.
The Nautilus, Vol. 92, No. 4, p 153-155, 1978. 1 fig, 4 ref.

Descriptors: *Mussels, *Clams, *Industrial wastes, Municipal wastes, Habitats, Water quality, Channel improvements, Acid streams, Coal mine wastes, Chemical wastes, Water analysis, Animal populations, *West Virginia, *Unionid clams, *Upper Kanawha River(W VA).

During the summer of 1976 a survey of the upper Kanawha River produced thirteen species of unionid clams. Although suitable habitat was found throughout the drainage, clams were found in only the upper reaches of the river. Possible explanations for the absence of clams downstream are industial and urban pollution and habitat modification for navigational purposes. (EIS-Deal)
W79-01435

ACUTE TOXICITY AT THREE PRIMARY SEWAGE TREATMENT PLANTS,
International Pacific Salmon Fisheries Commission, New Westminster (British Columbia).
D. W. Martens, and J. A. Servizi.
International Pacific Salmon Fisheries Commission, Progress Report No 33, 20 p, 1976. 8 tab, 22 ref.

Descriptors: *Toxicity, *Bioassay, *Sockeye salmon, Statistical methods, Sewage treatment, Sewage effluents, Ammonia, Surfactants, Water pollution sources, Water pollution effects, Fry, Mortality, Iron, Copper, Alkalinity, Bioassays, Canada, Primary sewage effluent, Vancouver(British Columbia).

Continuous flow bioassays were conducted at three primary sewage treatment plants in the Greater Vancouver area using fingerling sockeye salmon (Oncorhynchus nerka). Geometric mean survival time (GMST) in undiluted primary effluent and survival during 96 h exposure to a range of dilutions was measured. Multiple regression analysis was used to obtain a relationship between GMST and constituents of primary sewage at one treatment plant. Anionic surfactants and un-ionized ammonia were positively correlated with acute toxicity but iron and alkalinity were negatively correlated. However, these substances did not account for all the acute toxicity measured. Although copper was present at significant concentration, it was not correlated with acute toxicity. (EIS-Deal)
W79-01436

EFFECTS OF INDUSTRIAL WASTEWATER EFFLUENTS ON WATER QUALITY IN GIBSON COVE AND KODIAK HARBOR, KODIAK, ALASKA, AUGUST 26-29, 1974.
Environmental Protection Agency, Anchorage, AK. Alaska Operations Office.
Working Paper No. EPA-910-8-76-095, 62 p, June 1975. 8 tab, 6 ref, append.

Descriptors: *Water quality standards, *Water analysis, *Alaska, *Food processing industry, *Shrimp, Commercial shellfish, Water quality control, Water quality, Water chemistry, Chemical analysis, Commercial fishing, Water temperature, Hydrogen ion concentration, Bottom sediments, Effluents, Waste water disposal, Waste disposal, Solid wastes, Water pollution sources, Water pollution effects, Kodiak, Alaska.

A brief water quality survey was conducted at Gibson Cove and Kodiak Harbor, Kodiak, Alaska to determine the water quality influences of waste discharges from 15 seafood processing plants following installation and operation of screening equipment for solid removal from processing wastewater effluents, and to assay any improvements in the waste receiving waters as a consequence of installation of these screens. Data obtained from three water column stations and one bottom station in Gibson Cove, and 10 water column stations plus 11 bottom stations in Kodiak Harbor consisted primarily of measurements for dissolved oxygen, temperature, pH, conductivity, and transparency, and selected chemical and visual analyses of bottom deposits. The degree of water quality impairment was discussed and recommendations for improvement were provided. (EIS-Deal)
W79-01437

INFLUENCE OF TEMPERATURE ON GROWTH PROMOTION AND BODY COMPOSITION OF CARP (CYPRINUS CARPIO) DUE TO BOVINE GROWTH HORMONE,
Minnesota Univ., St. Paul. Dept. of Entomology, Fisheries, and Wildlife.
I. R. Adelman.
Transactions of the American Fisheries Society, Vol. 107, No. 5, p 747-750, 1978. 3 tab, 10 ref.

Descriptors: *Carp, *Growth rates, *Fish physiology, *Water temperature, Proteins, Biochemistry, Animal metabolism, Weight, Size, Fish behavior, Fish management, Freshwater fish, Lipids, Aquiculture, *Hormones, *Growth hormones, *Tissue analysis.

Yearling carp held at four constant temperatures were injectd with bovine growth hormone. A relatively greater responsiveness to growth hormone injections was found at below-optimum temperatures of 9.2 and 19.5C and the above-optimum temperature of 35.8C than at the optimum temperature for growth, 29.6C. There was no significant effect of the hormone on body composition. (EIS-Deal)
W79-01438

NITROGEN FERTILIZATION OF PONDS,
Auburn Univ., AL. Dept. of Fisheries and Allied Aquacultures.
C. E. Boyd, and J. W. Sowles.
Transactions of the American Fisheries Society, Vol. 107, No. 5, p 737-741, 1978. 5 tab, 17 ref.

Descriptors: *Sunfishes, *Bass, *Fertilization, Fertilizers, Nutrient requirements, Nitrogen, Phosphorus, Nutrients, Sport fish, Ponds, Fish management, Fish stocking, Nitrate, Plankton, Growth rates, Phytoplankton, Productivity, Bluegill, Largemouth bass, Aquiculture.

Nitrogen fertilization failed to increase the production of bluegill (Lepomis macrochirus) and plankton in small experimental ponds which were also fertilized with phosphorus. In an experiment conducted in larger ponds, nitrogen plus phosphorus fertilization was no more effective than phosphorus-only fertilization in promoting plankton growth. However, an earlier experiment demonstrated that the addition of nitrogen and phosphorus fertilizers to ponds increased bluegill production, but not largemouth bass (Micropterus salmoides) production, above that achieved with phosphorus-only fertilization. Nevertheless, phosphorus-only fertilization will appreciably increase production of sport fish in ponds, and because of the added cost, nitrogen fertilizers should not be used in fertilization programs for most sportfish ponds. (EIS-Deal)
W79-01439

EFFECT OF LONG-TERM REDUCTION AND DIEL FLUCTUATION IN DISSOLVED OXYGEN ON SPAWNING OF BLACK CRAPPIE, POMOXIS NIGROMACULATUS,
Environmental Research Lab.-Duluth, MN.
A. R. Carlson, and L. J. Herman.
Transactions of the American Fisheries Society, Vol. 107, No 5, p 742-746, 1878. 1 fig, 1 tab, 9 ref.

Descriptors: *Dissolved oxygen, *Sunfishes, *Seasonal, *Spawning, Fish behavior, Toxicity, Fish reproduction, Mortality, Growth rates, Water temperature, Embryonic growth stage, Fish physiology, Animal metabolism, Fertility, Methodology, *Survival, *Tissue analysis, Black crappie.

Mature black crappies were exposed over winter in the laboratory to constant dissolved oxygen concentrations near 2.5, 4.0, 5.5, and 7.0 mg/liter. Starting on 26 April during a simulated spring-to-summer rise in water temperature, some were continued at the original oxygen concentrations while others were subjected to mean diel fluctuations ranging from 0.8 to 1.9 mg O2/liter above and below the original concentrations. Controls were maintained at concentrations near air saturation. No spawning occurred at the lowest fluctuating treatment of 1.8 to 4.1 mg/liter. This treatment also caused behavioral aberrations as the water temperature reached 20C. Successful spawning occurred during all other treatment. (EIS-Deal)
W79-01440

THE BEHAVIOR OF JUVENILE ATLANTIC SALMON (SALMO SALAR) AND BROOK TROUT (SALVELINUS FONTINALIS) WITH REGARD TO TEMPERATURE AND TO WATER VELOCITY,
Woods Hole Oceanographic Institution, MA.
R. J. Gibson.
Transactions of the American Fisheries Society, Vol. 107, No. 5, p 703-712, 1978. 3 fig, 6 tab, 23 ref.

Descriptors: *Fish behavior, *Brook trout, *Atlantic salmon, *Water temperature, Juvenile growth stage, Seasonal, Habitats, Spawning, Fish reproduction, Fish physiology, Velocity, Flow, Turbulent flow, Cold-water fish, Animal metabolism, *Substrates, *Parr, Matamek Research Station, Quebec.

Atlantic salmon parr and brook trout were observed in stream tanks at the Matamek Research Station, Quebec. In the autumn, at 10C Atlantic salmon parr began sheltering in rubble and at 9C the majority had disappeared into hiding. Brook trout also had this tendency to hide at cold temperatures, but not as strongly as the salmon. In slow water flows, Atlantic salmon parr tended to hide in the rubble substrate at any temperatures, and aggression decreased. In both slow and faster water velocities during summer and autumn the commonest agonistic act by Atlantic salmon parr was 'charge and chase'. Brook trout in July showed 'nip' as the commonest agonistic act, but in September and October 'approach' and 'charge and chase' were more common, possibly due to aggression associated with spawning. Shade was attractive to both species in shallow water, but given the choice of a shallow (30 cm) tank with a shade cover, and deeper (50 cm) tank with no shade, the majority of brook trout and Atlantic salmon selected the deeper tank. In one experiment in a shallow-water tank, turbulent water surface was more attractive to Atlantic salmon parr than shade. (EIS-Deal)
W79-01441

METHODS OF CONTAMINATION OF TWO FRESHWATER FOOD CHAINS BY COBALT 60: I. DIRECT CONTAMINATION OF THE ORGANISMS BY THE WATER (MODALITES DE LA CONTAMINATION DE DEUX CHAINES TROPHIQUES DULCAQUICOLES PAR LE COBALT 60: I. CONTAMINATION DIRECTE DES ORGANISMES PAR L'EAU),
CEA Centre d'Etudes Nucleaires de Cadarache, Saint-Paul-les-Durance (France). Lab. D'Etude de la Pollution des Eaux.
A. Amiard-Triquet, and L. Foulquier.
Water, Air, and Soil Pollution, Vol. 9, p 475-489, 1978. 2 fig, 4 tab, 40 ref.

Descriptors: *Food chains, *Cobalt, Path of pollutants, Tracers, Radioactivity techniques, Chlorella, Daphnia, Crustaceans, Mollusks, Carp, Crayfish, Chemical properties, Trophic level, Ecosystems, Metals, *Elodea, *Bioaccumulation.

The behavior of Cobalt 60 in two freshwater food chains was examined. Concentration factors obtained in laboratory conditions are of limited value for extrapolation to environmental conditions; however, such experimental data do have a relative value. Generally the most highly contaminated species were the primary elements in the food chain, particularly macrophytes. Radioactivity levels in animal species decreased directly with increasing zoological complexity, which in turn generally corresponded to a higher trophic level. This factor must be considered during subsequent research on Cobalt 60 transfer in ecosystems through the food vector. (EIS-Deal)
W79-01442

METABOLISM OF POLYCHLORINATED BIPHENYLS BY MARINE BACTERIA,
Woods Hole Oceanographic Institution, MA.
A. E. Carey, and G. R. Harvey.
Bulletin of Environmental Contamination and Toxicology, Vol. 20, No. 4, p 527-534, 1978. 3 fig, 25 ref.

Descriptors: *Polychlorinated biphenyls, *Metabolism, *Microbial degradation, Biodegradation, Marine bacteria, Chemical analysis, Chemical properties, Bottom sediments, Organic compounds, Radioactivity techniques, Aroclors, Path of pollutants, Marshes, *Radiochromatography.

Mixed cultures of nearshore marine bacteria are capable of metabolizing PCBs. We have isolated and partially characterized an acid lactone metabolite whose structure is unlike any thus far reported in PCB metabolism studies. We found no metabolism in an anaerobic marine mud incubated with a chloribiphenyl isomer for 6 weeks. These results imply that in the large areas of anoxic sediments found in marshes, estuaries and basins like the Black Sea, PCBs will remain unaltered biologically or chemically. These anaerobic environments may then serve as long term sinks for PCBs. (EIS-Deal)
W79-01443

LAG ADJUSTMENT BETWEEN ESTIMATED AND ACTUAL PHYSIOLOGICAL RESPONSES CONDUCTED IN FLOW-THROUGH SYSTEMS,
Canada Centre for Inland Waters, Burlington (Ontario).
A. J. Niimi.
Journal of the Fisheries Research Board of Canada, Vol. 35, p 1265-1269, 1978. 2 fig, 10 ref.

Descriptors: *Bioassay, *Analytical techniques, *Mathematical studies, Laboratory tests, Testing procedures, Absorption, Respiration, Toxicity, Fish physiology, Animal physiology, Animal metabolism, Mathematical models, Methodology, *Depuration.

The results from physiological experiments that use a flow-through or open system may be biased because of the lag. The nature of this discrepancy is attributable to a delay between the actual response of an organism and the measured response of the system. An equation is presented that would adjust the measurement for lag. This procedure is especially important when measuring time-dependent uptake and depuration rates like those reported in respiratory and toxicological studies. (EIS-Deal)
W79-01445

EFFECTS OF CHELATED IRON ON THE GROWTH OF TWO SPECIES OF VALLISNERIA,
University of South Florida, Tampa. Dept. of Biology.
P. M. Dooris, and D. F. Martin.
Water Resources Bulletin, Vol. 14, No. 5, p 1088-1093. 1978. 4 tab, 12 ref.

Descriptors: *Iron, *Chelation, *Plant growth, *Aquatic weeds, Dissolved oxygen, Metals, Plant physiology, Plant growth regulators, Aquatic weed control, Organic compounds, Nutrient requirements, Growth rates, Eutrophication, Lakes, Lake stages, *Vallisneria, *EDTA.

Iron, added as (Fe-EDTA)-, was found stimulatory to V. spiralis at a concentration of 0.05 ppm. It had no effect upon growth of V. neotropicalis as measured by changes in dissolved oxygen and dry weight. Results are compared with those derived from similar studies with Hydrilla verticillata and Egeria densa. The implications of lake drawdown and aeration are discussed. (EIS-Deal)
W79-01446

A BIOLOGICAL ASSESSMENT OF FISH AND BENTHIC POPULATIONS INHABITING A KRAFT MILL EFFLUENT CHANNEL,
Florida Univ., Gainesville. School of Forest Resources and Conservation.
R. B. Juul, and J. V. Shireman.
Water Research, Vol. 12, p 691-701, 1978. 6 fig, 3 tab, 19 ref.

Descriptors: *Pulp wastes, *Diptera, *Sunfishes, *Catfishes, *Food habits, Chemical wastes, Industrial wastes, Fish populations, Benthic fauna, Bullheads, Seasonal, Effluents, Biological treatment, Water chemistry, Water quality, Growth rates, Fish reproduction, Industrial effluents, Water pollution effects, *Mosquitofish.

Various aspects of the benthos and fish populations living within a kraft pulp mill effluent channel were monitored from June, 1974 to September, 1975. Chironomid larvae dominated the benthos, and were distributed within the channel in relation to bottom type and current characteristics. Yearly abundance of chironomid larvae was correlated with measured flow through the channel. A total of 25 species of fish were taken from the channel. Many of these were collected seasonally and did not appear to be permanent residents of the channel. Food habits for warmouth revealed chironomid larvae and mosquitofish to be major food items. White catfish and brown bullhead had similar feeding habits. All fish examined for food habits utilized other aquatic insects to a greater extent in the summer, as they became more abundant with vegetational increases in the channel. The growth of warmouth and white catfish in the channel appears to equal or possibly surpass some natural waters. (EIS-Deal)
W79-01448

EFFECT OF COMPLEXATION BY NATURAL ORGANIC LIGANDS ON THE TOXICITY OF COPPER TO A UNICELLULAR ALGA, MONOCHRYSIS LUTHERI,
National Marine Fisheries Service, Beaufort, NC. Beaufort Lab.
W. G. Sunda, and J. M. Lewis.
Limnology and Oceanography, Vol. 23, No. 5, p 870-876, 1978. 3 fig, 4 tab, 14 ref.

Descriptors: *Copper, *Toxicity, *Aquatic algae, Chemical properties, Chemical reactions, Chemical analysis, Water analysis, Copper sulfate, Water chemistry, Growth rates, Reproduction, Phytoplankton, Productivity, *Ligands, *Complexation, Detoxification.

The effect of copper on the division rate of a unicellular alga was tested in media with different concentrations of natural organic ligands. Filtered river water containing a high concentration of organic matter was added in different proportions to culture media to vary the level of copper complexation. Increased binding of copper by natural ligands was associated with decreased toxicity of a given concentration of added CuSO4. The decrease in copper toxicity with increasing complexation could be explained quantitatively in terms of a dependency of toxicity on the concentration of free cupric ion. These results indicate that complexation of copper by organic ligands should considerably influence the toxicity of copper in natural waters through the effect of such complexation reactions on free cupric ion concentrations. (EIS-Deal)
W79-01449

ON THE PHARMACOLOGICAL EFFECTS OF DIISOPROPYLNAPHTHALENE ON YELLOW-TAIL (IN JAPANESE),
Tokyo Univ. of Fisheries (Japan). Lab. of Physiology and Pathology.
H. Ozaki, and Y. Ikeda.
Journal of the Tokyo University of Fisheries, Vol. 62, No. 2, p 147-157, 1976. 6 tab, 1 pl, 6 ref.

Descriptors: *Toxicity, *Fish diseases, Organic compounds, Animal pathology, Cytological studies, Enzymes, Lipids, Fish physiology, Animal metabolism, Biochemistry, Nitrogen compounds, Chemical properties, *Tissue analysis, *Yellowtail, *Seriola, *DIPN.

The pharmacological effects of diisopropylnaphthalene (DIPN) on yellow-tail were examined anatomically, hematologically, and hematochemically at 14 and 27 days after a single intraperitoneal irjection. The main symptoms observed were hypertrophy of the liver, spleen, kidney, and digestive tube, erosion of liver parenchyma, intraperitoneal congestion, and adhesion and frosted liver and spleen, suggesting the toxic chronic peritonitis. The hematological symptoms were not significant, but the serum levels of certain enzyme activities, nitrogenous compounds, lipids, and minerals were altered significantly indicating disorders of liver and kidney, in accordance with the results obtained in the mammals administered DIPN orally or intraperitoneally. (EIS-Deal)
W79-01450

EFFECT OF DIBASOL AND VITAMIN B12 ON THE LARVAE OF AURELIA AURITA (SOYPHOZA) IN A REDUCED SALINE MEDIUM,
Akademiya Nauk SSSR, Leningrad. White Sea Biological Station.
V. Y. Berger.
The Soviet Journal of Marine Biology, Vol. 3, No. 5, p 358-363, 1977. 5 fig, 5 tab, 11 ref. (Translation from the Russian).

Descriptors: *Resistance, *Salinity, *Jelly fish, *Alcohols, Larval growth stage, Sea water, Vitamins, Nutrient requirements, Adaptations, Aquatic populations, Proteins, Biochemistry, Metabolism, Cytological studies, Toxicity, Mortality, Bioassays, *Dibasol, Aurella aurita.

The acclimation of jelly fish larvae (Aurelia aurita) to diluted sea water (14%) increased their tolerance and resistance to low salinity and decreased resistance to ethyl alcohol. The administration of solutions of dibasol and vitamin B12 in concentrations of the order of 1.0 microg/ml to planulae produced a slight additional increase intolerance to low salinity. At the same time their alcohol resistance sharply increased in comparison with the tolerace of planulae which were not given theis treatment. The author examined the role of protein synthesis in the processes of phenotypical adaptations to salinity and differences in the mechanisms of specific and nonspecific reactions. (EIS-Deal)
W79-01451

ACUTE EFFECTS OF UNDERWATER CONSTRUCTION BLASTING ON FISHES IN LONG POINT BAY, LAKE ERIE,
Ontario Ministry of Natural Resources, Port Dover.
G. C. Teleki, and A. J. Chamberlain.
Journal of the Fisheries Research Board of Canada, Vol. 35, p 1191-1198, 1978. 4 fig, 3 tab, 17 ref.

Descriptors: *Mortality, *Explosions, *Fishkill, Explosives, Rock excavation, Fish physiology, Construction, Harbors, Animal pathology, Hydraulic properties, Fluid mechanics, Fish populations, Sediments, Turbidity, Lake Erie, Dissolved carbon dioxide, Trauma, Fish morphology, Underwater construction blusting.

We detonated 201 blasts with a high explosive Hydromex) in 4-8 m of water in Naticoke, Lake Erie. Shortly after each blast turbidity ad CO2 concentrations increased markedly returning to ambient levels within 3 h of the blast. Postblast pressure and charge weight were directly related. Common blast-induced injuries were swimbladder ruptures and hemorrhaging in the coelomic and pericardial cavities. Laterally compressed species were more susceptible to blast pressure gradients than were the fusiform fishes. Temporarily, surface mortalities were high only in the spring and late summer. Spatially, 57% of the total blast mortality was not visible from the water surface. (EIS-Deal)
W79-01452

IMPORTANCE OF ALGAE IN THE DIET OF THE OLIGOCHETES LUMBRICULUS VARIEGATUS (MULLER) AND RHYACODRILUS SODALIS (EISTEN),
Environmental Protection Service, Yellowknife (Northwest Territories).
J. W. Moore.
Oecologia, Vol. 35, p 357-363, 1978. 2 fig, 1 tab, 26 ref.

Descriptors: *Oligochaetes, *Food habits, Seasonal, Animal behavior, Aquatic algae, Eutrophication, Aquatic populations, Sediments, Productivity, Trophic level, Detritus, Primary productivity, Cytological studies, *Lumbriculus, *Rhyacodrilus, *Tissue analysis.

The importance of algae in the diet of the oligochaetes Lumbriculus variegatus and Rhyacodrilus sodalis was determined from collections made in a eutrophic bya. During the summer, algae represented 70-85% ofthe gut contents of both species. Almost all species were consumed in proportion to their abundance in the environment. The high level of algal consumption exhibited by the oligochaetes was primarily related to the large standing crop of algae on the sediments. During the winter, when algal densities were low in the environment, detritus and associated bacteria were the major food source. (EIS-Deal)
W79-01453

EFFECT OF THERMAL SHOCK ON PREDATOR AVOIDANCE BY LARVAE OF TWO FISH SPECIES,
Environmental Research Lab., Narragansett, RI.
C. F. Deacutis.
Transactions of the American Fisheries Society, Vol. 107, no. 4, p 632-635, 1978. 1 tab, 22 ref.

Descriptors: *Water temperature, *Resistance, *Predation, Prey fish, Larval growth stage, Thermal pollution, Heated water, Killifishes, Fish behavior, Fish physiology, Water pollution effects, Toxicity, Bioassay, Laboratory test, *Thermal shock, *Paralichthys, *Menidia.

Larvae of two fish species, Menidia menidia and Paralichthys dentatus, were subjected to a 15-min thermal shock of 10C above acclimation temperature, returned to acclimation temperature and exposed to a predator, Fundulus majalis. Four- and six-week-old M. menidia were significantly more vulnerable to predation after being shocked than control larvae, but younger larvae were not. Shocked larvae of P. dentatus were less susceptible to predation than control larvae. (EIS-Deal)
W79-01454

CHRONIC EXPOSURE OF CHINOOK SALMON EGGS AND ALEVINS TO GAMMA IRRADIATION: EFFECTS ON THEIR RETURN TO FRESHWATER AS ADULTS,
Washington Univ., Seattle. Coll. of Fisheries.
W. K. Hershberger, K. Bonham, and L. R.

Donaldson.
Transactions of the American Fisheries Society, Vol. 107, no. 4, p 622-631, 1978. 4 tab, 22 ref.

Descriptors: *Chinook Salmon, *Irradiation, *Gamma rays, *Radioactivity effects, Fish eggs, Fry, Radiation, Growth rates, Mortality, Fish reproduction, Spawning, Fertility, Sterility, Fish populations, Radiosensitivity, Radiobiology.

Chinook salmon eggs and alevins were exposed to various levels of continuous gamma irradiation to determine the level at which the return of these individuals as adults would be affected. Large number of eggs (63,000 to 140,000) were used for each treatment, along with an equal number of controls. The dose rate ranged from 0.5 R/day in 1960 to 50 R/day in 1970; dose rate approximately doubled in each of the later years. After rearing for about 90 days, the control and irradiated groups were differentially marked and released for their migration to salt water. On their return, 2 to 6 yr later, length, weight, and sex data were determined on each adult salmon. No significant change was noted in adult returns until irradiation levels of 10 R/day and above were used. At these levels, analyses showed retardation in growth and increased mortality of the small salmon in fresh water, decreased numbers of adults returning to spawn, increased age at return, and apparent sterility in the adult males. The dose-response relationship did not appear to be linear. (EIS-Deal)
W79-01455

CHLORINE EFFECTS ON LARVAL DEVELOPMENT OF STRIPED BASS (MORONE SAXATILIS), WHITE PERCH (M. AMERICANA) AND BLUEBACK HERRING (ALOSA AESTIVALIS),
Maryland Univ., Solomons. Chesapeake Biological Lab.
R. P. Morgan, Jr., and R. D. Prince.
Transactions of the American Fisheries Society, Vol. 107, no. 4, p 636-641, 1978. 2 fig, 1 tab, 15 ref.

Descriptors: *Chlorine, *Toxicity, *Striped Bass, *White Perch, *Herring, Larval growth stage, Growth rates, Bioassay, Chlorination, Fish eggs, Fish populations, Hatching, Fish physiology, *Biocides, *Mutagens.

Eggs of striped bass, white perch, and blueback herring were exposed to a series of total residual chlorine (TRC) concentrations until hatching occurred. larval development of the three species was inhibited by increasing TRC concentrations. Length of larval fish at hatch decreased with increasing TRC concentrations and the production of abnormal blueback herring larvae with increasing TRC concentrations. (EIS-Deal)
W79-01456

THE INFLUENCE OF TEMPERATURE AND SALINITY ON THE TOXICITY OF HEXAVALENT CHROMIUM TO THE GRASS SHRIMP PALAEMONETES PUGIO (HOLTHUIS),
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Zoology.
R. R. Fales.
Bulletin of Environmental Contamination and Toxicology, Vol. 20, no. 4, p 447-450, 1978. 1 fig, 1 tab, 11 ref.

Descriptors: *Toxicity, *Chromium, *Shrimp, *Water temperature, *Salinity, Mortality, Bioassay, Animal physiology, Animal metabolism, Food webs, Laboratory tests, Seasonal, Water pollution effects, Animal behavior, *Grass shrimp, *Palaemonetes.

The purpose of this study was to indicate the influence of temperature and salinity on the capacity of hexavalent chromium (potassium chromate) to cause physiological damage to the grass shrimp as evidenced by 48-h static bioassays performed at eight different thermo-saline combinations. The data indicate that toxicity is enhanced by increased temperature or decreased salinity. The implications are that grass shrimp are most likely to be adversely affected when the habitat is warm (summer and early autumn, thermal effluents) and the saline water is diluted (mouth of rivers, periods of heavy rainfall). (EIS-Deal)
W79-01457

CYCLING OF ELEMENTS IN DUCKWEED (LEMNA PERPUSILLA) IN AN ASH SETTLING BASIN AND SWAMP DRAINAGE SYSTEM,
Virginia Polytechnic Inst. and State Univ., Blacksburg, Dept. of Biology.
J. H. Rodgers, Jr., D. S. Cherry, and R. K. Guthrie.
Water Research, Vol. 12, p 765-770, 1978. 2 fig, 4 tab, 21 ref.

Descriptors: *Thermal powerplants, *Fossil fuels, *Plant physiology, *Fly ash, Thermal pollution, Coals, Heavy metals, Settling basins, Swamps, Migratory birds, Chemical analysis, Industrial wastes, Path of pollutants, Neutron absorption, Activation energy, Waste treatment, Mercury, Selenium, *Duckweed, Lemna, Bioaccumulation, Biomagnification, *Ash, *Tissue analysis.

Duckweed inhabiting a stream-swamp drainage system that received high quantities of coal ash or thermal discharges from a fossil fuel power plant, was the only abundantly occurring macrophyte. For a period of 1 yr, accumulations of 22 elements in components of this system (water, sediments, and duckweed) were determined at six stations using neutron activation analysis. Abiotic processes (e.g. settling, solution) were important in cycling some elements including heavy metals, while some potentially toxic elements (e.g. Hg and Se) were bioconcentrated by duckweek. In those stations where ash influence was greater in water and sediments, elemental uptake by duckweed was also higher. The use of duckweed as food may be a potential source of bioaccumulation or biomagnification of toxic elements by migratory wildfowl that frequent ash-impacted drainage systems. (EIS-Deal)
W79-01458

THE TOXIC EFFECT OF COPPER ON ALGAE AND ROTIFERS FROM A SODA LAKE (LAKE NAKURU, EAST AFRICA),
Norsk Inst. for Vannforskning, Blindern.
T. Kallqvist, and B. S. Meadows.
Water Research, vol 12, p 771-775, 1978. 3 fig, tab, 13 ref.

Descriptors: *Copper, *Toxicity, Photosynthesis, Growth rates, Cyanophyta, Rotifers, Aquatic populations, Alkaline water, Metals, Aquatic algae, Primary productivity, Metabolism, Africa, *Spirulina, *Soda Lakes, Kenya.

The effect of Cu(II) ions on the photosynthetic oxygen production of phytoplankton, the growth rate of the blue-green algae Spirulina platensis and the population of rotifers in water from the soda lake Nakuru in Kenya was investigated. The photosynthetic production was reduced to 80% of the control by the addition of 0.1 mg Cu 1-1 and 50% by addition of 0.15-0.20 mg Cu 1-1. The growth rate of Spirulina platensis was more affected by copper than the photosynthesis of phytoplankton. The rotifers were less sensitive to copper than the algae, but after 8 days exposure to 0.5 mg Cu 1-1 or more the population was severely affected. (EIS-Deal)
W79-01459

INFLUENCE OF SEDIMENT IN COPPER TOXICITY TESTS WITH THE POLYCHAETE NEANTHES ARENACEODENTATA,
Environmental Research Lab., Narragansett, RI.
For primary bibliographic entry see Field 5A.
W79-01460

EXPERIMENTAL STUDY ON THE CONCENTRATION PROCESS OF TRACE ELEMENT THROUGH A FOOD CHAIN FROM THE VIEWPOINT OF NUTRITION ECOLOGY,
Okayama Univ. (Japan). Inst. for Agricultural and Biological Sciences.
For primary bibliographic entry see Field 5B.
W79-01461

MORTALITIES OF PEN-REARED SALMON ASSOCIATED WITH BLOOMS OF MARINE ALGAE,
Fisheries and Marine Service, Nanaimo (British Columbia). Pacific Biological Station.
G. R. Bell, W. Grifficen, and O. Kennedy.
In: Proceedings of the Northwest Fish Culture Conference, 25th Anniversary, Dec. 4-6, 1974. p 58-60. 1 tab, 1 ref.

Descriptors: *Aquiculture, *Mortalities, On-site-investigations, *Algae, Diatoms, Sockeye salmon, Bioassays, Fish hatching, *Marine algae, *Fish culture, Pan-reared salmon, Fish diseases, Chaetoceros.

Mortalities of pen reared sockeye salmon, in the marine environment were associated with certain algal blooms. The gills of dead fish were covered with an olive green scum and the gill lamellae were surrounded with diatomaceous algae, mostly Chaetoceros. (EIS-Deal)
W79-01462

AMMONIA PRODUCTION RATE AND ITS APPLICATION TO FISH CULTURE SYSTEM PLANNING AND DESIGN,
Kramer, Chin, and Mayo, Inc., Seattle, WA.
P. B. Liao.
In: Proceedings of the Northwest Fish Culture Conference, 25th Anniversary, Dec. 4-6, 1974, p 107-114.

Descriptors: *Aquiculture, *Fish hatcheries, *Fish production, Fish establishment, *Fish farming, Foods, Growth rate, Design criteria, Design data, *Ammonia, *Dissoved oxygen, Fish food, Water purification, Water requirements, Fish physiology.

Oxygen consumption and ammonia proudction rates must be taken into account in determining water requiremenets for any fish culture system. The paper is intended to briefly summarize ammonia production rate and its application in fish culture system planning and design. (EIS-Katz)
W79-01465

THE IMPACT OF LOGGING ON SALMONID RESOURCES IN THE PACIFIC NORTHWEST,
Washington Univ., Seattle. Fisheries Research Inst.
For primary bibliographic entry see Field 4C.
W79-01466

WASTE HEAT AQUACULTURE,
Kramer, Chin and Mayo, Inc., Seattle, WA.
K. W. Watters.
In: Twenty-Eighth Northwest Fish Culture Conference, Dec. 6-8, 1977, Olympia, Wash., p 94-99.

Descriptors: *Aquiculture, Shrimp, Lobsters, Fish conservation, *Fish farming, *Fish establishment, Fish hatcheries, Oysters, Catfish, Fish reproduction, *Water temperature, Thermal powerplants, Thermal water, Thermal power, *Vermont Yankee Facility, *Waste heat aquaculture, Salmonid aquaculture.

The possibilities and problems of using the waste heat derived from thermal electrical generation plant for aquaculture are discussed. Existing facilities for raising shrimp, lobsters, catfish, oysters, freshwater shrimp and salmon are described. The proposed Vermont Yankee salmon rearing facility are discussed in detail. (EIS-Katz)
W79-01467

THE AVAILABILITY OF SEDIMENT-BOUND COBALT, SILVER, AND ZINC TO A DEPOSIT-FEEDING CLAM,
Geological Survey, Menlo Park, CA.
For primary bibliographic entry see Field 5B.
W79-01468

WATER QUALITY INVESTIGATION RELATED TO SEAFOOD PROCESSING WASTEWATER DISCHARGES AT DUTCH HARBOR, ALASKA, OCTOBER 1975, OCTOBER 1976,
Environmental Protection Agency, Anchorage, AL. Alaska Operations Office.
R. K. Stewart, and D. R. Tangarene.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 545, Price codes: A05 in paper copy, A01 in microfiche. Report EPA-910-8-77-100, 78 p, May 1977. 7 fig, 7 tab, 1 app, 5 ref.

Descriptors: *Commercial shellfish, *Food processing industry, *Water quality standards, *Water analysis, Shrimp, Alaska, Water quality control, Water quality, Water chemistry, Chemical analysis, Commercial fishing, Bottom sediments, Effluents, Waste water disposal, Waste disposal, Solid wastes, Water pollution sources, Water pollution effects, Dutch Harbor, Alaska.

Because of the large volume of shellfish processed and associated wastes produced it was determined that information on the water quality effects of waste discharges by shellfish processors should be gathered. Seafood processing waste discharges were found to be primarily responsible for the observed depressed oxygen concentrations and increased nutrient concentrations. Seafood waste discharges have been and continue to be largely responsible for the formation of sludge deposits in the Dutch Harbor embayment. Recommendations for water quality improvement were presented. (EIS-Deal)
W79-01469

ORGANIC CONTAMINANTS,
Environmental Research Lab. Duluth, MN.
G. E. Glass, W. M. I. Strachan, W. A. Wilford, F. A. I. Armstrong, and K. L. E. Kaiser.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 769, Price codes: A02 in paper copy, A01 in microfiche. The Waters of Lake Huron and Lake Superior, Vol. 3 (part B), ch 6.4, p 417-502, 1977, Report to the International Joint Commission by the Upper Lakes Reference Group. 42 ref.

Descriptors: *Pollutants, *Organic compounds, *Lake Superior, *Water pollution sources, *Water pollution effects, Polychlorinated biphenyls, DDT, Dieldrin, Aldrin, Chlorinated hydrocarbon pesticides, Pesticide residues, Great Lakes, International Joint Commission, Biodegradation, Degradation(Decomposition), Toxicity, Poisons, Taste, Odor, Bioaccumulation, Phenols, Fallout, Pulp and paper industry, Lakes.

Organic pollutants, which may constitute the most widespread waste loadings in waters of Lake Superior, are classified and their effects evaluated. There are essentially three categories: (1) compounds that readily degrade biologically or chemically; (2) less readily degraded compounds which may be directly toxic to aquatic life or consumers, may be bioconcentrated to toxic levels, or may be metabolized to a more toxic form and stored in higher organisms (such as PCBs); and (3) compounds which cause taste and odor problems in domestic water supplies or fish (such as phenols). Dispersion of persistent organic pollutants occurs both within the lake and through atmospheric transport. Continuation of pollution by toxic organics could result in loss of the fisheries. Excessive levels of taste- and odor-causing compounds are traceable to pulp and paper mills. Conclusions: (1) there should be a total ban on PCBs, aldrin, dieldrin, and DDT and its derivatives; a and (2) there should be no increased manufacture, use, or discharge of such other man-made organics as halogenated hydrocarbons until effects are fully understood. Specific contaminats contaminants covered are: PCBs, DDT and its metabolites, aldrin plus dieldring, hexachlorobenzene, Lindane, chlordane, methoxychlor polynuclear aromatic hydrocarbons, chlorobenzene conpounds, phenols, phthalate esters, chloronorbornene, octachlorostyrene, methylbenzothophene, biphenyl, endosulfan, cyanide, and heptachlorepxide. (Lynch-Wisconsin)
W79-01471

CORALVILLE WATER QUALITY STUDY ANNUAL REPORT, WATER YEAR OCTOBER 1, 1975 TO SEPTEMBER 30, 1976,
Iowa Univ. Iowa City, Inst. of Hydraulic Research.
For primary bibliographic entry see Field 5B.
W79-01473

A DYNAMIC WATER QUALITY MODEL OF LAKE BIWA - A SIMULATION STUDY OF THE LAKE EUTROPHICATION,
Kyoto Univ. (Japan). Dept. of Applied Mathematics and Physics.
S. Ikeda, and N. Adachi.
Ecological Modelling, Vol. 4, No. 2-3, February 1978, p 151-172. 19 fig, 2 tab, 12 ref.

Descriptors: *Eutrophication, *Mathematical models, *Lake Biwa(Japan), *Water quality, *Dynamic models, *Cycling nutrients, Nutrients, Nitrogen, Phosphorus, Japan, Lakes, Model studies, Simulation analysis, Potable water, Water supply, Water pollution effects, Analytical techniques, Ecosystems, Phytoplankton, Algae, Yodo River Basin(Japan), Water management, Water level fluctuations, Water temperature, Discharge(Water).

A dynamic simulation model of nitrogen and phosphorus cycles in Lake Biwa, Japan's largest lake, was developed to study eutrophication phenomena and to assist with future control policy for protection of the lake ecosystem. The model is a five-block system, consisting of three geographic components (two in the larger Northern Lake and one in the Southern Lake) and two depth layers in each of the blocks of the Northern Lake. Temperature and water quality are assumed to be uniform within each block. External effects, such as water temperature, nutrients, and water outflow have great effects on the model. If the inflow of nutrients continues to increase the plankton will also increase, gradually leading to saturation. It is therefore imperative to remove as much nutrient as possible before it flows into the lake. A sudden and rapid variation in outflow from the Sourthern Lake may cause a drastic phytoplankton bloom, and the preliminary simulation study indicates that the water utilization project in Lake Biwa must be examined from the viewpoint of ecological stability in the nutrient cycle. The simulation compared well with observed data, except that predicted phytoplankton bloom period and extent, and ratio of organic to inorganic nitrogen were high. The lake is the origing of the Yodo River which supplies drinking water to 12 milion people and industrial water to the economic center of western Japan. (Lynch-Wisconsin)
W79-01475

USE OF UNICELLULAR ALGAE FOR EVALUATION OF POTENTIAL AQUATIC CONTAMINANTS,
California Univ., Irvine.
For primary bibliographic entry see Field 5A.
W79-01476

NUTRIENT RECOVERY FROM FARM PONDS: HYDROPONIC PLANT PRODUCTION AND OTHER MEANS, A REVIEW,
Agricultural Research Service, Durant, OK. Water Quality Management Lab.
L. J. McBride, and R. G. Menzel.
Agricultural Research Service, S-177, May 1978. 11 tab, 222 ref.

Descriptors: *Reviews, *Nutrient removal, *Farm ponds, *Hydroponics, *Eutrophication, *Aquiculture, *Beneficial use, *Biocontrol, Aquatic weeds, Plants, Half-saturation constant, Limiting factors, White amur, Ctenopharyngodon idella, Fish, Algae, Phytoplankton, Nutrients, Water pollution control, Nonpoint pollution, Hydrogen ion concentration, Nutrient requirements, Plant growth.

Literature on several methods for recovering nutrients from eutrophic farm ponds were reviewed with most attention devoted to culturing terrestrial plants in a hydroponic system leading to a high cash value crop. Other methods considered were direct utilization of aquatic weeds and use of a monoculture such as fish or algae. Comparison of nutrient-absorbing capabilities of various plant species using the half-saturation constant, K sub m, showed that many terrestrial species have an advantage over mot phytoplankton species in potassium uptake, compete about equally for phosphate, and are disadvantaged in nitrate uptake. Phosphate and nitrate are most likely to be limiting nutrients in farm ponds. For successful hydroponic culture, stirring and pH control would probably be necessary; alkaline pH lessens nitrate and phosphate uptake. Terrestrial plants will not remove sufficient phosphorus from farm ponds to limit phytoplankton blooms. Terrestrial plants studied included various grains, vegetable crops, and pasture species. Most species would grow poorly to moderately well due to inadequate phosphate concentration in ponds, and in some cases to insufficient nitrate levels. Direct utilization of aquatic weeds or algal monocultures have limited immediate potential due to high costs of harvesting and drying, low cash value of by-products, and possible need to add nutrients to ponds to sustain production. Harvesting of fish is not an efficient nutrient removal method. An algal monoculture would face similar problems to direct aquatic weed utilization. (lynch-Wisconsin)
W79-01477

5D. Waste Treatment Processes

NITROGEN AND PHOSPHORUS BEHAVIOR DURING AEROBIC DIGESTION OF WASTE ACTIVATED SLUDGE,
New Hampshire Univ., Durham. Dept. of Civil Engineering.
M. Farmer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 670, Price codes: A05 in paper copy, A01 in microfiche. MS Thesis, January 1977. 67 p. 5 fig, 11 tab, 35 ref, 2 append. OWRT A-037-NH(2), 14-31-0-01-4029.

Descriptors: Nitrogen cycle, Chemical reaction, Waste water treatment, Activated sludge digestion, *Sludge digestion, Aerobic treatment, *Aerobic digestion, Feed modes, Digester, Stabilization of wastewater sludges.

Experimental results indicate that significant amounts of solid phase nitrogen and phosphorus are released to the supernatant during aerobic digestion of waste activated sludge. These findings differ from results reported by other investigators who studied digestion of primary sewage sludge. Nitrification is likely to occur during aerobic digestion of activated sludge. This will result in consumption of digester alkalinity and a tendency for pH to drop. Denitrification can also occur. Digested sludge suspended solids contained about 2.0% phosphorus and 6 to 7% nitrogen. Aerobic digestion of waste extended aeration activated sludge was conducted in laboratory scale digesters to investigate the fate of nitrogen and phosphorus during aerobic stabilization. Digestion was performed at 20C with both batch and continuous (daily draw ad fill) feed modes of operation. Experimental data were analyzed in light of knowledge of nitrogen and phosphorus in activated sludge and biological nitrification and denitrification. Predicting the release of solid phase nitrogen and phosphorus to the digester supernatant, and differences between aerobic digestion of activated sludge and primary sludge were also considered.
W79-01003

RECOVERY OF NITROSAMINES FROM WATER,
Cornell Univ., Ithaca, NY. Lab of Soil Microbiology.
M. M. Nikaido, D. Dean-Raymond, A. J. Francis, and M. Alexander.
Water Research, Vol. 11, p 1085-1087, December

1977. 3 tab, 8 ref. OWRT A-055-NY(2), 14-31-0001-5032, 14-34-0001-6033.

Descriptors: *Water sampling, *Water pollution control, Lakes, Toxicity, Sewage effluents, Gas chromatography, *Resins, *Amberlite XAD-2 resin, Waste water treatment, Chemical precipitation, *Nitrosamines, Natural waters, Carcinogens, Distilled water.

A method was devised for the recovery of dialkylnitrosamines in the parts/10 to the 9th power level. The procedure involved the addition of K2CO3 to water samples and concentration of the nitroso compounds on Amberlite XAD-2 resin. The recoveries of dimethyl- and diethylnitrosamines were greater than 90%.
W79-01006

ELECTROCHEMICAL PURIFICATION OF WASTEWATERS, CONTAINING POLYESTER RESIN (ELEKTROKHIMICHESKAYA OEHISTKA STOCHNYKH VOD, SODERZHASHCHIKH POLIEFIRNUYU SMOLU),
G. I. Fishman, I. D. Pevzner, and N. D. Melent'eva.
Plasticheskie Massay, No. 5, p 61-62, 1978. 2 fig, 6 ref.

Descriptors: *Chemical wastes, *Electrochemistry, *Resins, *Flocculation, *Dewatering, Anodes, Sodium chloride, Electrolysis, Chlorine, Coagulation, Separation techniques, Aluminum, Waste water treatment, Disinfection, Industrial wastes.

Laboratory studies examined the feasibility of electrochemical purification of polyester resin-vearing effluents generated during the manufacture of these resins and in aluminum foundries. The model waste water used in the experiments contained 650-3,000 mg/liter polycster resin. After homogenization, 10% solutions of sodium hydroxide and aluminum sulfate or aluminum chloride were added to the waste water for flocculation. The solids were separeated out and dewatered mechanically. After a 10% solution of sodium chloride was added, the clarified waste water, containing dissolved polyester resin, was treated electrochemically with a lead dioxide anode. The polyester resin was decomposed into carbon dioxide and water during electrolysis. The treated effluent, containing active chlorine, was an acceptable agent for disinfecting other waste waters. (Takacs-FIRL)
W79-01066

HYDROGEN RECOVERY FROM PURGE GAS OF AMMONIA PLANTS,
Fertiilzer Association of India, Trombay.
K. S. Chari.
Chemical Age of India, Vol. 29, No. 4, p 283-285, April, 1978. 1 fig.

Descriptors: *Ammonia, *Hydrogen, *Adsorption, *Absorption, *Sieves, Condensers, Cryogenics, Equipment, Design data, Cooling, Distillation, Separation techniques, Pressure, Waste water treatment, Industrial wastes.

Three different systems for recovering hydrogen from purge gas have been developed by Union Carbide Corp. and Petrocarbon Developments. Union Carbide's Ammonia Vent Recovery system, suitable for plants with capacities of 1,000 tons/day or more, throttles purge gas up to 50-75 kg/sq cm and either absorbs ammonia into water in an absorption tower or condenses it by cooling to an anhydrous product. The purge gas is chilled and condensed in a cold box where 85-95% of the hydrogen is recovered and returned to the synthesis loop; the fuel gas stream, bearing argon and methane, is passed to the reformer burners. Union Carbide's Pressure Swing Absorption system for 700 ton/day plants is a single-step process which uses four units for selective adsorption ad desorption of inert gases. One unit provides continuous adsorption of product flow; the remaining three operate at various stages of depressurization, regeneration by sweeping impurities from the vessels at reduced pressure, and repressurization. Nitrogen must be added to all of the systems to maintain the appropriate hydrogen to nitrogen ratio. Petrocarbon Developments' hydrogen recovery unit incorporates pretreatment, final cleanup, and cryogenic separation. Ammonia is removed from the purge gas in the pretreatment stage by vapor absorption in a packed column and distillation to anhydrous form in a reboiler. In the final clean up, purge gas is filtered through a two-bed molecular sieve; this is followed by a cryogenic separator equipped with an aluminum alloy plate, a tin heat exchanger, separators, and a refrigeration cycle. (Lisk-FIRL)
W79-01067

EXTRACTION OF AMMONIUM IONS FROM WASTEWATERS GENERATED IN THE PRODUCTION OF COMPOUND FERTILIZERS AND THEIR UTILIZATION BY ION-EXCHANGE METHOD (IZVLECHENIE IONOV AMMONIYA IZ STOCHNYKH VOD PROIZVODSTY SLOZHNYKH UDOBRENII IKH UTILIZATSIYA METODOM IONNOGO OBMENA),
A. Ashirov.
Zhurnal Prikladnoi Khimii, Vol. 51, No. 5, p 991-997, 1978. 4 fig, 2 tab, 5 ref.

Descriptors: *Chemical wastes, *Fertilizers, *Filtration, *Ammonia, *Ion exchange, Cations, Saturation, Phosphorus compounds, Separation techniques, Waste water treatment, Industrial wastes.

Optimum conditions for the removal and recovery of ammonium ions and other cations from waste waters generated during the manufacture of compound fertilizers were studied and an ion exchange treatment process was developed. The waste water to be treated was first passed through a quartz sand filter for the removal of suspended matter. Ammonium ions and other catios were extracted by upflow through a series of continuous ion exchange columns. Upon saturation, the ion exchange resing was regenerated by treatment with 20-40% phosphoric acid. The ammonium phosphate solution obtained was recycled in the production of ammonium phosphate fertilizer. (Takacs-FIRL)
W79-01068

PHOTO-DECOMPOSITION OF AQUEOUS SOLUTIONS OF PHENOL (FENOORU SUIYOEKI NO HIKARI BUNKAI),
K. Aisaka, and S. Suzuki.
Kankyo Gijutsu, Vol 7, No. 4, p 314-319, 1978. 10 fig, 1 tab, 15 ref.

Descriptors: *Phenols, *Irradiation, *Degradation(Decomposition), *Heavy metals, *Chemical wastes, Rivers, Acidity, Nitrates, Chlorides, Sulfur compounds, Trace elements, Copper, Iron, Manganese, Zinc, Waste water treatment, Industrial wastes.

Photochemical decomposition of phenolic solutions by mercury lamp irradiation was measured in the presence of other substances and in river water. An 0.00001 M solution of phenol was reduced by 90% through exposure to high-pressure mercury lamp irradiation for 150 min. The pseudo-order of the reaction was pH dependent, ranging 0.85-0.92; phenolic decomposition increased in acidic solutions. Degradation in acidic solutions was further influenced by the type of acid involved, i.e. sulfuric, hydrochloric, or nitric acid. The type of basic solution did not appear to affect phenol decomposition. Nitric acid had a significant impact upon phenol reduction. The influence of zinc, copper, iron, manganese, and chloride ions on phenol decomposition was also examined. Iron enhanced phenol decomposition, while copper reduced the removal rate. The higher initial decomposition rate of phenol in river water was attributed to the influence of COD, BOD, and trace metal concentrations. Hydroquinone was identified by liquid chromatography as a by-product of phenol degradation. (Lisk-FIRL)
W79-01069

WASTEWATER PROBLEMS IN THE FOOD PROCESSING INDUSTRY IN THE LIGHT OF MODERN WATER MANAGEMENT (AZ ELELMISZERIPAR SZENNYVIZ-PROBLEMAI A KORSZERU VIZGAZDALKODAS TUKREBEN),
Elelmezesi Ipar, Vol. 32, No. 6, p 201-208, 1978. 4 fig, 6 tab, 12 ref.

Descriptors: *Food processing industry, *Activated sludge, *Nutrient requirements, *Biological treatment, *Chlorination, Ozone, Biochemical oxygen demand, Chemical oxygen demand, Phosphorus, Nitrogen, Percolation, Waste water treatment, Industrial wastes.

Modern waste water and sludge treatment methods utilized by the Hungarian food processing industry are reviewed. The BOD level of effluents generated in the food processing industry ranges over 40-3,000 mg/liter and COD over 1,500-7,800 mg/liter. Mechanical treatment may achieve a removal efficiency of 5-30%. Following mechanical treatment, the waste water may be subjected to biodegradation under aerobic conditions in activated sludge plants or under partially aerobic conditions in ponds. Adequate supplies and phosphorus are essential for the growth of microorganisms. Trickling filtes are characterized by low energy consumption (0.2 kWh/kg BOD) at fairly high performance (3-5 kg BOD/sq m/day). In the third stage, residual pollutants may be further removed by biological or physicochemical methods. If necessary, pathogenic microorganisms can be destroyed by chlorination or ozonation. After conditioning, the sludge generated in the treatment process is dewatered by means of filters or centrifuges. Waste waters other than those generated by the meat processing industry, in particular slaughterhouses, are usually amenable to farmland application without spcial treatment. (Takacs-FIRL)
W79-01071

WASTEWATER TREATMENT IN THE SUGAR INDUSTRY (II) (ABWASSERAUFBEREITUNG DER ZUCKERWARENINDUSTRIE (II)).
Zucker- und Suesswaren Wirtschaft, Vol. 31, No. 6, p 253-256, June, 1978. 6 fig, 4 tab, 5 ref.

Descriptors: *Sugar corps, *Food processing industry, *Water reuse, *Activated sludge, *Filtration, Centrifugation, Separation techniques, Biological treatment, Heat transfer, Organic wastes, Emulsions, Aeration, Waste water treatment, Industrial wastes.

Waste water characteristics and treatment processes in the sugar industry are described. The overall waste water load can be reduced through recirculation of warm waste waters and by reuse of cooling water as process water. Solids can be separated for recycling by filtration and centrifugation. Dissolved or emulsified organic matter can be biologically degraded. Biological treatment is generally in the form of trickling filtration or the activated sludge process with aeration. Principles of trickling filtration are described and complemented by design data for two trickling filter systems. Design criteria, operating requirements, and associated costs are provided for a model, medium sized sugar refinery using the oxygen-activated sludge process. (Takacs-FIRL)
W79-01072

DETERMINATION OF THE BICHROMATE OXIDIZABILITY OF SUGAR FACTORY EFFLUENTS (OPREDELENIE BIKHROMATNOY OKISLYAEMOSTI STOCHNYKH VOD SAKHARNOGO ZAVODA),
For primary bibliographic entry see Field 5A.
W79-01074

SEWAGE FROM THE YEAST INDUSTRY: ITS NATURE AND ITS PURIFICATION (ABWASSER DER HEFEINDUSTRIE, BESCHAFFENHEIT UND REINIGUNG),
H. Ruffer.
Industrieabwaesser, p 46-51, June, 1978. 1 fig, 5 tab, 14 ref.

Descriptors: *Yeasts, *Food processing industry, *Sulfates, *Waste dilution, *Anaerobic conditions,

Odor, Sewers, Oxidation, Decomposing organic matter, Irrigation, Return flow, Groundwater, Evaporation, Feeds, Waste water treatment, Waste water disposal, Industrial wastes.

The state-of-the-art of waste water treatment by the yeast industry of West Germany is described. Although they are free of toxic substances, yeast manufacturing effluents are characterized by a COD level of 5,000-25,000 mg/liter and a BOD of 4,000-20,000 mg/liter. The effluents are usualy discharged into a municipal sewer system. Rapid dilution is required to prevent corrosion of the sewer pipes by sulfate, the development of anoxic conditions, and the resulting release of malodorous substances upon rapid decomposition. Fouling can be prevented by the addition of oxidants at the source. Waste waters from the yeast industry can generally be used for irrigation without any risk of groundwater contamination. In some modern plats, effluents are concentrated by evaporation and the residual vinasse used as an additive for cattle feed. (Takacs-FIRL)
W79-01075

PREPARATION OF COPPER PRECIPITATE FOR ELECTROLYTIC COPPER RECOVERY FROM ELECTROPLATING INDUSTRY WASTEWATER (DENKI MEKKI KOJO HAISUI KARA NO DO NO DENKAI KAISHU O MOKTEKI TO SHITA DO CHINDEN NO SEISEI HOHO),
H. Nawafune, S. Mizumoto, and M. Kawasaki.
Kizoku Hyomen Gijutsu, Vol. 29, No. 9, p 34-38, 1978. 6 fig, 2 tab, 3 ref.

Descriptors: *Chemical precipitation, *Copper compounds, *Electrolysis, *Separation techniques, Industrial wastes, Recycling, Copper sulfate, Filtration, Carbonates, Alkali metals, Sludge treatment, Waste water treatment.

Studies were performed to devise a method for precipitating copper ions from electroplating effluents which would yield a product amendable to electrolytic recovery of the copper. Requirements for the precipitate were a low water content and a high filtration rate. Sodium hydroxide, sodium carbonate, and sodium bicarbonate were tested as precipitants for a copper sulfate solution. The residual copper concentration and final pH of the solution and the filtration characteristics of the precipitate were measured after treatment with the three precipitating agents at temperatures of 30, 50, 70 and 80 C; initial pH values of 7, 8, 9, and 10; and cureing times covering 35 min to 168 hrs. Addition of the precipitants to the copper sulfate solutions yielded a bluish white precipitate which gradually converted to green crystalline malachite ($Cu(OH)(CO3)0-5$). This conversion to malachite was accelerated by warming. The precipitate was characterized by a high filtration rate, low water content of 20% or less, and easy recoverability by elctrolysis. Analysis of costs in Japan for chemicals, electric power, sludge disposal, and the value of the recovered copper demonstrated that a postive return could be obtained by a copper precipitation system having a capacity of 10 kg/day. (Schulz-FIRL)
W79-01076

TREATMENT OF WASTEWATERS GENERATED IN ELECTROPLATING SHOPS BY REVERSE OSMOSIS. (1. CONCENTRATION OF WASHING WATERS FROM NICKEL-PLATING PROCESSES) (OCHISTKA STOKOV GAL'VANOTSEKHOV METODOM OBRATNOGO OSMOSA (1. KONTSENTRIROVANIE PROMYVNKH VOD NIKELIROVANIYA),
Y. Y. Snukishkis, and G. A. Laumyanskas.
Trudy Akademii Nauk Litovskoy SSR, Sirya B, Vol. 1, No. 104, p 63-67, 1978. 5 fig, 3 ref.

Descriptors: *Reverse osmosis, *Nickel, *Semipermeable membranes, *Sulfates, *Membrane processes, Chlorine, Boron, Separation techniques, Selectivity, Permselective membranes, Cellulose, Fibers(Plant), Waste water treatment, Industrial wastes.

The effectiveness of reverse osmosis by means of semi-permeable cellulose acetate membranes, in the form of flat films and hollow fibers, was tested with synthetic waste waters similar to those generated in nickel plating shops. In the pressure range of 25-100 atm, the selectivity of flat membranes was 68-90% for Ni(+2), 85-90% for SO4(-2), 49-65% for C1(-), and 20-30% for B. At a concentration of 1.7 g/liter, the productivity increased from 339 to 470 liters/sq m/day as the pressure was increased from 25 to 75 atm. The selectivity of the membrane increased but the flux declined with an increase in influent strength. Hollow fiber membranes were capable of removing 77% of Ni(+2), 71% of SO4(-2), 64% of C1(-), and 26% of B at 25 atm pressure and a flow rate of 22 liters/sq m/day. (Takacs-FIRL)
W79-01077

EFFLUENT TREATMENT PLANT CLEANS UP DOWN THE VALLEYS,
Processing, Vol. 24, No. 8, p 21, 23, 24, 1978. 1 fig.

Descriptors: *Tin, *Sodium compounds, *Water reuse, *Effluent streams, *Oily water, Alkaline water, Acidic water, Chemical precipitation, Ion exchange, Resins, Filtration, Emulsions, Separation techniques, Aeration, Oxidation, Settling basins, Sands, Reclamation, Waste water treatment, Industrial wastes.

Five separate effluent streams from British Steel Corp.'s Ebbw Vale tin plating works in Gwent, Wales, are treated for recycling or discharge in a new 200,000 gal/hr treatment plant. Tin brightening quench water, containing tin and phenol sulfonic acid, is treated with 5% NaOH for pH adjustment; precipitated tin hydroxide is dewatered to 70% solids on a filter press; and acidic supernatant is recycled to the pickler rinse section of the electrolytic tining lines. Sodium dichromate rinses are recovered in a closed-loop ion exchage system; deionized water is returned to the passivation sections; both quench waters and dichromate rinses can be treated in the acidic rinse stream if necessary. A tilting plate separator removes most of the oil from emulsions originating in the cold rolling mills; chemical treatment and flotation remove the remaining oil for disposal; water flows to the acidic rinse stream. Alkaline streams are pumped directly to the acidic main stream treatment process where iron-bearing acid and sodium bisulfite reduce chromium to the trivalent state; overflow from the chromium reduction pit enters the phenol sulfonic acid oxidation stage where residual acid is oxidized by 10% H202. (Lisk-FIRL)
W79-01078

EFFECT OF COPPER AND TRI- AND HEXAVALENT CHROMIUM ON THE WORK OF AN ACTIVATED SLUDGE,
Warsaw Univ. (Poland). Dept. of Environmental Microbiology.
E. Bieszkiewicz, and A. Hoszowski.
Acta Microbiologica Polonica, Vol. 27, No. 2, p 147-153, 1978. 7 fig, 9 ref.

Descriptors: *Activated sludge, *Copper, *Chromium, *Inhibition, *Performance, Chemical oxygen demand, Oil industry, Oil wastes, Respiration, Toxicity, Waste water treatment, Industrial wastes.

The tolerence levels of oil refinery activated sludge microorganisms were defined for copper, trivalent chromium, and hexavalent chromium. Crude oil refinery and synthetic wastes bearing an active culture were spiked with 0.2-1.0 mg copper sulfate/liter, 0.5-75.0 mg chromium nitrate/liter, and 0.5-75.0 mg potassium dichromate/liter. The impact of the heavy metals on the performance of the activated sludge microorganisms was measured according to the COD removal efficiency. In the presence of more than 0.8 mg copper/liter, COD removal declined with increasing retention times; the sludge volume index of crude oil refinery wastes increased. In synthetic wastes bearing 1.0 mg copper sulfate/liter, COD was reduced by only 29% and the sludge volume index increased 311-320 ml/g. A significant drop from 80% COD removal efficiency was observed in the refinery waste system when trivalent chromium levels exceeded 15 mg/liter; similar results were observed with synthetic wastes and metal concentrations above 30 mg/liter. Hexavalent chromium levels greater than 30 mg/liter hindered the activated sludge performance with refinery wastes and also increased the sludge volume index; similar responses were observed in the synthetic wastes at slightly higher metal concentrations. (Lisk-fir)
W79-01079

APPLICATION OF PACKED BIOPOLAR CELL TO ELECTROLYTIC TREATMENT OF WASTE WATERS, (IN JAPANESE),
Kyoto Univ., (Japan). Dept. of Industrial Chemistry.
S. Yoshimura, A. Katagiri, and S. Yoshizawa.
Nippon Kagaku Kaishi, No. 8, p 1144-1149, 1978. 7 fig, 26 ref.

Descriptors: *Electrolysis, *Metals, *Copper, *Chemical wastes, *Activated carbon, Electrodes, Industrial wastes, Separation techniques, Waste water treatment.

An electrolytic method of treatment was tested for industrial waste waters containing heavy metals and/or cyanide. The process employed a pack biopolar cell in which particles capable of conducting a fairly high electrical field were packed between a main anode and a cathode. In an example cited, metallic copper present in the form of copper sulfate solution was deposited on activated carbon particles. The concentration of copper in the solution was rapidly reduced, reaching a minimum of about 2 mg/liter. The presence of this lower limit was attributed to anodic dissolution of deposited copper as a result of agitation by gas evolved during electrolysis. When the packed cell was tested with a potassium cyanide solution, removal of cyanide ions was rapid initially and then levelled off. The addition of a copper cyanide solution to the cell resulted in rapid cyanide decomposition, suggesting the presence of a catalytic effect on anodic oxidation. Electrolysis over a 4-hr period reduced the cyanide concentration in solution from 1,000 to 0.3 mg/liter. Favorable results were also obtained with a stable ferricyanide complex. (Schulz-FIRL)
W79-01080

FIXED-BED ELECTROLYSIS - A PROCESS FOR PURIFYING WASTE WATER CONTAMINATED WITH METALS (FESTBETTELEKTROLYSE - EIN VERFAHREN ZUR REINIGUNG METALLHALTIGER ABWASSER),
G. Kreysa.
Chemie-Ingenieur-Technik, Vol. 50, No. 5, p 332-337, 1978. 10 fig, 3 tab, 15 ref, 1 append.

Descriptors: *Electrolysis, *Heavy metals, *Separation techniques, *Anodes, *Cathodes, Copper, Zinc, Cadmium, Palladium, Mercury, Ion exchange, Membrane processes, Metals, Waste water treatment, Industrial wastes.

Pilot plants studies of a fixed-bed electrolysis process for treating waste streams bearing heavy metals preceded installation of an automated full-scale plant for treatment of copper-bearing electroplating rinse waters. The fixed-bed electrolysis unit was designed as an alternative to hydroxide precipitation for recovering metal contaminants for reuse and for recycling electroplating wash waters. Expansion of the specific surface area of the electrode permitted high metal recovery from low strength wash water. The pilot unit contained a fixed-bed cathode, a graphite anode, and an ion exchange membrane. It was operated at a flow rate of 50 liters/hr at a metal concentration of 100 ppm. Pilot plant studies indicated that copper, zinc, cadmium, palladium, and mercury could be reduced to less than 1 ppm. The design configuration of the full-scale, fixed-bed electrolysis unit to recover copper was presented and performance during start-up was described. (Lisk-FIRL)
W79-01081

WATER CONTENT REDUCTION OF METAL-PLATING WASTE SLUDGE BY A PRESS AND CENTRIFUGE (MEKKI SURAJI NO KOKAI-TEKI DASSUI NI KANSURU KISOTEKI KENKYU),
For primary bibliographic entry see Field 5E.
W79-01082

OXIDATION OF LYES AND TREATMENT OF WASTEWATER WITH GASEOUS OXYGEN (OKISPENIE SHCHELOKOV I OBRABOTKA STOCHNYKH VOD GAZOOBRAZNYM KISLORODOM),
G. L. Akim.
Bumazhnaya Promyshlennost, No. 5, p 10-15, 1978. 1 fig, 17 ref.

Descriptors: *Pulp wastes, *Pulp and paper industry, *Oxidation, *Sodium compounds, *Sulfides, Aeration, Odor, Filtration, Digestion, Heating, Waste water treatment, Industrial wastes.

Previous studies on and practical applications of the use of oxygenation to oxidize sulfides and other malodorous organic compounds in black pulping liquors are reviewed. When oxygen is added directly to the cooker 10-15 min before the end of the digestion process, 99% of the methylmercaptan and dimethysulfide is oxidized. At an oxygen consumption of about 45 kg/ton of pulp, 90% of the sodium sulfide is oxidized. Black liquor can also be oxygenated in bulk before washing on filters; oxyen is introduced through vertical pipes in counterflow to the black liquor at a temperature of 75-85C. Complete oxidation of the sulfide is achieved at an oxygen-to-sulfide ratio of 1.25-1.35. Weak black liquor can also be oxidized in a contact chamber, preferably in two stages. The optimum temperature for black liquor oxidation is 95-110C. Sulfides are oxidized most efficiently at a liquor pH greater than 12. (Takacs-FIRL)
W79-01083

INVESTIGATIONS OF THE DECOLORATION OF WASTEWATERS GENERATED IN CONFIER SULFATE PULP MILLS (CERCETARI PRIVIND DECOLORAREA APELOR REZIDUALE PROVENITE DE LA FABRICAREA CELULOZEI SULFAT DIN RASINOASE),
M. Puiu, M. Bolohan, and R. Turchevici.
Celuloza si Hirtie, Vol. 27, No. 2, p 60-68, 1978. 12 fig, 6 tab, 6 ref.

Descriptors: *Pulp wastes, *Pulp and paper industry, *color, *Sulfates, *Lime, Ion exchange, Resins, Reverse osmosis, Iron compounds, Chemical precipitation, Separation techniques, Filration, Waste water treatment, Industrial wastes.

Various chemical methods were tested for removing color from effluents generated by conifer sulfate pulp mills. These methods included: flocculation with lime, ferric sulfate, aluminum sulfate, or ferric chloride; activated carbon adsorption; treatment with ion exchange resins; and reverse osmosis. Only decoloration with lime and aluminum sulfate was found to be economically feasible for industrial-scale application. The precipitate formed during decoloration with lime was easily separated by filtration. (Takacs-FIRL)
W79-01084

LABORATORY INVESTIGATION OF WATER POLLUTION BY ORGANIC SUBSTANCES IN FLAX WASTES DELIGNIFICATION (LABORATORNE SLEDOVANIE ORGANICKEHO ZNECISTENIA VOD PRI DELIGNIFIKACII LANOVYCH ODPADOV),
Vyskumny Ustav Papieru a Celulozy, Bratislava (Czechoslovakia).
For primary bibliographic entry see Field 5B.
W79-01085

OZONATION FOR CONTROL OF ENTERIC VIRUSES IN SEWAGE EFFLUENT,
Rhode Island Univ., Kingston. Dept. of Animal Pathology.
P. W. Chang.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 688, Price codes: A02 in paper copy, A01 in microfiche. Rhode Island Water Resources Center Completion Report, October 1978. 11 p, 7 tab. OWRT A-064-RI(1), 14-34-0001-8042.

Descriptors: *Ozone, Inactivation, *Enteric viruses, Sewage treatment, *Viruses, *Ozonation, *Waste water treatment.

The object was to determine guidelines for dosage and contact time of ozone with respect to virus inactivation in various types of secondary sewage effluent. It was found that the demand of ozone for the inactivation of 5 human enteric viruses, namely poliovirus type 1, 2 and 3; Coxsackie virus type B5 and Echovirus type 12 in secondary effluent from different sewage plants varied greatly. Variation also occurred during different seasons of the year within the same sewage plant. Because of these variations between and within the sewage plants, a standard recommendation of ozone dosage and contact time cannot be applied for all plants or at all times within the same plants. However, a few generalizations can be stated: (1) Ozone given at 0.9-1.1 mg per liter, at a flow rate of 3 liters per minute, took 9 minutes to inactivate all 5 human enteric viruses in secondary sewage effluent. In some sewage plants, this time requirement was much less. (2) It appeared that different enteric viruses required different ozone treatment for inactivation. For Coxsackie virus type B5, the average time for inactivation (7.7 minutes) was much longer than that for poliovirus type 2 and 3 (5.6 minutes). (3) For some unknown reason, the sewage effluents collected during the spring season from two sewage plants required much higher ozone treatment than during the summer months.
W79-01088

BIO-REGENERATION OF HYDROCARBON-EXHAUSTED ACTIVATED CARBON.
Rhode Island Univ., Kingston.
C. W. Houston.
Available from the National Technical Information Service, Springfield, VA as PB-288 651 Price codes: A02 in paper copy, A01 in microfiche. Rhode Island Water Resources Center Technical Completion Report (1978). 4 fig, 8 tab, 6 ref. OWRT A-063-RI(1), 14-34-0001-8432.

Descriptors: *Bio-regeneration, *Activated carbon, Adsorption, Industrial wastes, Organic compounds, Biological treatment, Waste water treatment.

Activated carbon was exhausted with either glucose hydrocarbon (nonane or decane) and regenerated biologically with Escherichia coli or Pseudomonas aeruginosa, respectively. Regeneration was carried out in aerated glass columns after the addition of a mineral medium to supply nutrients other than the carbon source adsorbed on the carbon. Glucose-exhausted carbon was restored to full adsorption capacity following growth of E. coli. It is suggested that increased surface area resulting from abrasion during regeneration and washing may have compensated for any decreased adsorption capacity due to metabolic end-products and/or adhering cells. In contrast, the adsoption capacity of hydrocarbon-exhausted carbon regenerated by growth of P. aeruginosa was reduced approximately 66%.
W79-01093

COMPARISON OF IRON (III) AND ALUMINUM IN PRECIPITATION OF PHOSPHATE FROM SOLUTION,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Soil and Crops.
P. H. Hsu.
Water Research Vol. 10, p. 903-907, 1976. OWRT A-042-NJ(4).

Descriptors: *Phosphates, *Waste water treatment, *Water quality, *Aluminum, Chemical precipitation.

Although both iron (III) and aluminum salts have long been considered as coagulants for precipitation of phosphate from solution, the literature have been controversial. The author found in previous studies that the optimum acidity and the effectiveness of phosphate removal reported in the literature have been controversial. The author found in previous studies that the optimum acidity and the effectiveness of phosphate removal were greatly affected by the initial ratio of phosphate to coagulants, and the presence of sulfate and calcium. The objective of this report is to interpret that the differences observed are attributed to their different affinities for phosphate and their different hydrolysing powers.
W79-01095

DIRECT INJECTION OF RECLAIMED WATER INTO AN AQUIFER,
Stanford Univ., CA. Dept. of Civil Engineering.
P. V. Roberts, P. L. McCarty, and W. M. Roman.
Journal of the Environmental Division, Proceedings of the American Society of Civil Engineers, Vol. 104, No. EE5, p 933-949, October, 1978. 8 fig, 6 tab, 1 append, 6 ref.

Descriptors: *Water reuse, *Reclaimed water, *Injection, *Attenuation, Ground water recharge, Waste water disposal, Saline water intrusion, Subsidence, Aquifers, Artificial recharge, Ion exchange, Water quality, Water analysis, Potable water, Water demand, Water law.

Renovating and recycling wastewater are alternate means of meeting future water demands. The Environmental and Water Studies program at Stanford University has embarked on a 3-year study concerning the changes in water quality and aquifer characteristics resulting from the injection of reclaimed water. The ultimate goal is to ascertain whether direct injection of reclaimed water is a feasible and reliable strategy for producing potable water. An advanced wastewater treatment and injection-extraction system built by the Santa Clara Valley Water District (SCVWD) not only provides reclaimed water for landscape irrigation but also inhibits saline water intrusion and subsidence. An injection pilot study at the SDVWD facility found that during passage of reclaimed water through an aquifer most contaminants were removed by various mechanisms. These include: adsorption, ion exchange, precipitation and dissolution, chemical oxidation, biological nitrification and denitrification, aerobic or anaerobic degradation of organic substrates, mechanica dispeersion, and filtration. The dominant removal mechanism is believed to be ion exchange on clays. This pilot study will provide important information regarding the retention capacity of an aquifer for attenuating the movement of a wide spectrum of inorganic, organic, and microbia pollutants. These data will by used in monitroing a full-scale well field operation. (Purdin-NWWA)
W79-01108

REMOVAL OF METALLIC IMPURITIES FROM WATER BY ELECTROCHEMICAL METHODS,
Connecticut Univ., Storrs. Inst. of Water Resources.
N. D. Greene.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 687, Price codes: A02 in paper copy, A01 in microfiche. Research Project Technical Completion Report, 1978. 14 p, 2 tab, 5 fig, 7 ref. OWRT A-063-CONN(2), 14-31-0001-5007.

Descriptors: *Electrochemistry, *Heavy metals, *Water purification, Corrosion control, Waste water treatment, Water treatment, Kinetics, *Metal deposition kinetics, *Metal deposition kinetics, *Replacement reactions, *Heavy metal compounds, Electrolysis, Low cost methods, Active metal beds.

Heavy metal compounds such as mercury, copper, cadmium, lead, chromium and nickel in water and wastewater systems cause numerous problems. These include biological toxicity, enhanced corro-

sion (of aluminum) and interference with food and pharmaceutical process operations. The aim of this program was to develop new low cost methods for removing metallic impurities based on electrochemical techniques. Replacement reactions using static and fluidized active metal beds (aluminum, magnesium and zinc) were used to remove metallic impurities (such as (Hg (2+), Cu(2+), Pb(2+), Ni(2+), Co(2+), Cr(3+), Cr(6+)) from water. The results show that in many cases, this approach offers a practical method for removing metallic impurities from water and wastewater streams. (deLara-Conn)
W79-01121

A STUDY FOR IMPROVING THE AEROBIC-MEDIA TRICKLING FILTER FOR WASTEWATER TREATMENT,
West Virginia Univ., Morgantown. Water Research Inst.
W. R. Johnson, III, and C. R. Jenkins.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 775, Price codes: A03 in paper copy, A01 in microfiche. Information Report 12, 1978. 39 p, 13 fig, 9 tab, 25 ref, append. OWRT A-029-WVA(2), 14-31-0001-6051.

Descriptors: *Aerobic treatment, *Oxygenation, *Sewage treatment, *Trickling filters, *Waste water treatment, Aeration, Biological treatment, Equipment, Filters, Oxygen, Secondary treatment, Solid contact processes, Treatment, Waste treatment, Wastes, Water pollution treatment, Aerobic media, Aerobic-media trickling filter.

Improvements in the original design and additional information about the operational capabilities are demonstrated in this bench-scale study of the aerobic-media trickling filter (AMTF), a new concept of biological wastewater treatment. The uniqueness of this fixed growth system is that the inert media also provide aeration. The aerobic media consist of 276 small teflon tubes bonded into a pressurized oxygen manifold at one end of the unit and hanging in loops down the length of a vertical pipe flowing full of wastewater. Diffusion of pressurized oxygen through the very thin walls of the tubes provides the oxygen requirements. Recirculation is used to vary the hydraulic loading on the unit. Organic loading is varied by changing the concentration of the synthetic wastewater. This AMTF system accomplishes greater than 85 percent removal of BOD and is not adversely affected by excessive accumulations of slime. Its performance at high organic and hydraulic loadings indicates it would be amenable to secondary treatment of industrial and municipal wastewaters or would perform well in a roughing process. Preliminary information also indicates a large unit-volume reduction in the AMTF compared to an oxygen-activated sludge unit or a plastic media trickling filter.
W79-01123

HEAVY METAL ACCUMULATION AND ITS EFFECT ON THE BIOTA OF AN INDUSTRIAL SETTLING POND,
Montana Univ., Missoula. Dept. of Zoology.
G. F. Weisel, and M. A. Neher.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 822, Price codes: A06 in paper copy, A01 in microfiche. Montana University Joint Water Resources Research Center, Bozeman, Completion Report No. 90, December 1977. 98 p, 23 fig, 12 tab, 53 ref. OWRT A-102-MONT(1), 14-34-001-7122.

Descriptors: *Heavy metals, Industrial waters, *Biota, Aquatic life, *Settling basins, Waste disposal, Water pollution sources, *Montana, Sediments, Distribution, Waste water treatment, *Clark Fork River(Mont), Warm Springs(Mont), Butte(Mont).

The Warm Springs settling ponds are a source of heavy metal pollution to the Clark Fork River. This study determined the levels of heavy metals in the sediments, water, and selected biota of the settling ponds and compared these to a set of control ponds. The effects these metal concentrations may have on the biota were also considered. Metal concentrations were generally higher in sediments, water, and biota of the settling pond than in control ponds. Except for Cr and Pb, values are one to two orders of magnitude greater than concentrations of the same metals in the control pond sediments. Total metal concentrations in water were less than 1 ppm in the settling ponds, but were higher than levels in the control ponds. Species diversity and the equitability of the distribution of individuals within species of the aquatic macroinvertebrate community of the settling pond were comparable to or greater than these parameters of the control pond communities. Aquatic insects predominated in the settling pond community, whereas planaria, snails, and leeches predominated in the control ponds. Differences in species composition were influenced by phytological and chemical differences between control and settling ponds. Species of biota tolerant to heavy metal concentrations in the settling ponds were identified. (Tibbs-Montana)
W79-01124

OBSERVATIONS ON ALGAL POPULATIONS AND EXPERIMENTAL MATURATION POND SYSTEM,
Council for Scientific and Industrial Research, Pretoria (South Africa).
S. N. Shillinglaw, and A. J. H. Pieterse.
Water SA, Vol. 3, No. 4, p 183-192, December 1977. 10 fig, 4 tab, 16 ref.

Descriptors: *Algae, *Tertiary treatment, Sewage treatment, *Maturation ponds, *Nutrient removal, *Ammonia, *Limiting factors, Ponds, South Africa, Water reuse, Zooplankton, Carbon, Nitrogen, Hydrogen ion concentration, Nutrients, Retention time, Chlorophyll, Species composition, Seasonal, Chlorophyceae.

Increase in ammonia nitrogen levels when pH levels are high are thought responsible for sudden population declines of algae used for nutrient removal (especially ammonia and orthophosphate) in sewage maturation ponds at Pretoria, South Africa. Zooplankton grazing and carbon deficiency at peak algal concentrations are considered secondary causes. Increasing retention time in the ponds provides a possible means of preventing algal declines, since algae could adapt to ammonia increases in the influent and alleviate acute carbon deficiency through absorption of atmospheric carbon dioxide. Algal populations exhibited marked fluctuations throughout the period of study (August 1975-July 1976) with large concentrations, which could only be maintained for brief periods followed by drastic declines. Declines in chlorophyll-a were primarily due to actual removal of algal cells from suspention through sedimentation or through the outflow. Turbidity increases resulted from increases in algal cell concentrations, implying that light limitation would only occur at peak algal cell levels. However, light limitation was apparently not a major influence since declines proceeded to such lowlevels. Dominant species during declines included both Chlorophyceae and other species, in contrast to previous studies reporting only Chlorophyceae. Water temperature may have had some effect on algal growth. (Lynch-Wisconsing)
W79-01196

EQUITABLE RECOVERY OF INDUSTRIAL WASTE TREATMENT COSTS IN MUNICIPAL SYSTEMS, FEDERAL GUIDELINES.
Environmental Protection Agency, Washington, DC. Office of Air and Water Programs.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 437, Price codes: A03 in paper copy, A01 in microfiche. October 1971. 44 p, 1 append.

Descriptors: *Waste treatment, *Federal Government, *Cost allocation, *Standards, *Legislation, Industrial wastes, Water Quality Act, Sewage, Municipal wastes, Cost sharing, Effluents, Waste water treatment, Capital costs, Operating costs, Maintenance costs.

Federal guidelines included under Regulation 18 CFR 601.34, which are designed to ensure that the industrial share of allocatable treatment costs to be recovered is proportionate to the costs of treating industrial wastes, are supplemented and interpreted. The primary intention is to assist local and State agencies in administering the provisions of the Regulation. General provisions of the Regulation are clarified with emphasis on the scope of the provisions and criteria of acceptable compliance. The necessity for using average cost pricing being defined as the technique which allocates total system costs to attributable classes of users by establishing a uniform price per identifiable unit of discharge. A discussion of cost allocation methods includes quantity or quality formulas based on total cost of average unit costs. Also discussed are payment procedures, recovery systems and sources of revenue, and situations where inequities may arise, such as property taxes and quantity discounts. The principles described are illustrated by examples of actual calculations and the text of the Regulation 18 CFR 601.34 is included. (Majtenyi-IPA)
W79-01206

HOW TO OBTAIN FEDERAL GRANTS TO BUILD MUNICIPAL WASTEWATER TREATMENT WORKS.
Environmental Protection Agency, Washington, DC. Municipal Construction Div.
For primary bibliographic entry see Field 5G.
W79-01210

REMOVAL AND SEPARATION OF SPILLED HAZARDOUS MATERIALS FROM IMPOUNDMENT BOTTOMS,
Hittman Associates, Inc., Columbia, MD.
For primary bibliographic entry see Field 5G.
W79-01307

COST ESTIMATES FOR CONSTRUCTION OF PUBLICLY-OWNED WASTEWATER TREATMENT FACILITIES. VOLUME 3. SUMMARIES OF TECHNICAL DATA FOR COMBINED SEWER OVERFLOWS AND STORMWATER DISCHARGE. 1976 NEEDS SURVEY,
Environmental Protection Agency, Washington, DC. Office of Water Programs Operations.
For primary bibliographic entry see Field 5G.
W79-01308

IMPLEMENTING 'BEST MANAGEMENT PRACTICES' FOR RESIDUALS: THE WASTE EXCHANGE,
Environmental Protection Agency, Washington, DC. Office of Water Planning and Standards.
For primary bibliographic entry see Field 5G.
W79-01309

SENSITIVITY ANALYSIS OF A PHOSPHORUS REMOVAL STRATEGY COMPUTER MODEL,
JBF Scientific Corp., Wilmington, MA.
D. A. Barnes, and D. S. Yeaple.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 415, Price codes: A09 in paper copy, A01 in microfiche. 1968. 183 p, 7 tab, 2 ref, 5 append. 68-01-1531.

Descriptors: *Mathematical models, *Computer models, *Cost analysis, *Phosphorus removal, *Sewage treatment, Data processing, Evaluation, Municipal wastes, *Wastewater treatment, Economics, Data collection.

Results of a sensitivity analysis of a computer simulation model for evaluating phosphorus removal strategies are reported. Eighteen input paramenters were analyzed for five different communities ad their respective sewage treatment plats. The findings are considered useful for determining where the greatest effort in data collection should be expended to provide realistic input data for this model. It was determined that the parameter with greatest effect in ELIMIT, the effluent level in mg/1 of phosphorus. The second greatest effect was produced by PINPS, the influent (raw waste water) total phosphorus level in mg/1. Other pa-

rameters which affect treatment costs importantly are ALUMCS, the cost of alum is $/lb. FECLCS, the cost of ferric chloride in $/lb, and MATRLS, the wholesale price index. (Majtenyi-IPA)
W79-01310

DIFFERENTIAL BED KINETIC ANALYSIS OF HEAVY METAL REMOVALS BY BIOLOGICAL SLIMES,
Pittsburgh Univ., PA. Dept. of Civil Engineering.
R. D. Neufeld.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 636, Price codes: A12 in paper copy, A01 in microfiche. Report No. SETEC-CE-76-008, April 1976. 125 p, 53 fig, 12 tab, 27 ref, 4 append. GK 42150.

Descriptors: *Wastewater treatment, *Biological treatment, *Heavy metals, *Liquid wastes, *Sewage treatment, *Activated sludge, *Heavy metal removal, Kinetics, Equilibrium, Aqueous solutions, Mercury, Cadmium, Absorption, Separation techniques.

A study was conducted to examine the potential for the processing of heavy metal laden liquid waste with the use of biological slimes for the extraction and possible recovery of the heavy metal resource. This was accomplished by developing the operational parameters of kinetics and equilibria associated with the heavy metal removal. The two metals studied were soluble mercury, in concentrations ranging from 0.1 to 1000 mg/l, and soluble cadmium in concentrations ranging from 0.3 to 1000 mg/l. Equipment, chemicals, and experimental procedures used are detailed. Results indicate that activated sludge, typical of sewage treatment plant origin, has the capacity to remove mercury until the mercury on the floc is 12.0% by weight ratio; and cadmium, until the cadmium on the floc is 27.5% by weight ratio. In concentrations up to 30 mg/l of mercuryf and cadmium, it was found that activated sludge can sorb a higher weight fraction of liquid phase mercury than cadmium. Other factors studied included: pH, pressure drop, and behavior of glass wool, tubing and the reactor. (Gibson-IPA)
W79-01314

AN ASSESSMENT OF TECHNOLOGY FOR POSSIBLE UTILIZATION OF BAYER PROCESS MUDS,
Battelle Memorial Inst., Columbus, OH.
B. K. Parekh, and W. M. Goldberger.
Available from the National Technical Information Service, Springfield, VA as PB-266 678, Price codes: A08 in paper copy, A01 in microfiche. Final Report No. EPA-600/2-76-301, December 1976. 153 p, 14 fig, 26 tab, 613 ref, 2 append. R-803760-01.

Descriptors: *Industrial wastes, *Waste disposal, *Mud, *Dewatering, *Recycling, Bayer process, Bauxite, Evaluation, Solid wastes, Waste treatment, Coagulation, Chemical properties, Beneficiation.

The possibility of using mud wastes generated in the domestic production of alumina from bauxite ores was studied. After a thorough literature search on subjects related to the technology of bauxite processing, visits were made to six alumina plants in the U.S. to observe operations and discuss mud-handling methods and utilization possibilities. Mud samples were obtained for characterization and dewatering experiments. It was concluded that there is no possibility for utilization of the muds that could significantly affect the need for impoundment within the near term. However, it does appear possible to develop improved mud dewatering and impoundment methods and a joint industry-government program of demonstration and pilot projects is recommended. Further recommendations include: (1) basic research to study the mineral surface chemistry controlling the dewatering mechanism; (2) investigations of the possible beneficiation of muds into a raw material supplement in iron making; and (3) the possible use of mud as an absorbent in pollution abatement processes. (Majtenyi-IPA)
W79-01315

AUTOMATED TREATMENT AND RECYCLE OF SWINE FEEDLOT WASTEWATERS,
Ohio State Univ., Columbus.
E. P. Taiganides, and R. K. White.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 611, Price codes: A08 in paper copy, A01 in microfiche. Final Report No. EPA 600/2-76-240, September 1976. 151 p, 52 fig, 27 tab, 32 ref, 3 append. 1HB617, R-801125.

Descriptors: *Waste water treatment, *Solid wastes, *Farm wastes, *Recycling, Ultimate disposal, Biological treatment, Effluents, Hogs, Aerobic treatment, Waste storage, Oxidation, Agricultural engineering, Waste disposal, Fertilization, Computer models, Computer programs, Model studies, Evaluation.

A system for automatically flushing swine feedlot wastes and biological treatment and recycling of the liquid effluent was reviewed and evaluated. The procedure included: (1) hydraulic removal of wastes by flushing gutters with water from overhead siphon tanks and tipping buckets; (2) primary treatment consisting of a stabilization sump, solids separation with stationary and vibrating screens, aerobic stabilization of solids, solids storage tanks, and final disposal of settled solids on farm land; (3) secondary treatment consisting of an oxidation ditch, final clarifier, and re-use clarifier effluent as flushing liquid within the building; and (4) tertiary treatment consisting of laboratory evaluation of high-pressure driven membranes for removal of chemical nutrients from the clarifier effluent. It was concluded that such a system is both technically feasible and environmentally acceptable. In addition to the review and evaluation program, a computer program was developed to simulate operation of a biological treatment system with cropland disposal for any swine confinement production unit. This program should prove useful in providing functional design parameters and economic cost data for evaluating alternative management schemes under various cropping patterns for a given farm size and weather conditions. (Majtenyi-IPA)
W79-01316

REMOVAL OF SOLUBLE BOD SUB 5 PRIMARY CLARIFIERS,
Institute of Paper Chemistry, Appleton, WI. Effluent Processes Group.
G. A. Dubey, A. J. Wiley, and J. W. Collins.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 919, Price codes: A08 in paper copy, A01 in microfiche. Final Report No. EPA-600/2-76-221, September 1976. 152 p, 53 fig, 55 tab, 21 ref, 3 append. R-803119.

Descriptors: *Industrial pollution, *Waste water treatment, Sedimentation, *Biochemical oxygen demand, *Pulp wastes, Pulp and paper industry, Chemical oxygen demand, Suspended solids, Color, Flocculation, Filtration, Hydrogen ion concentration, Chemical properties, Chromatography, Efficiencies, Optimization, Surveys, Sampling, Costs.

An evaluation study was carried out on means for increasing biochemical oxygen demand (BOD) removal from primary systems treating pulp and paper wastes. Twelve mills were surveyed to obtain data on total and soluble BOD sub 5, chemical oxygen demand, suspended solids, and color removal from sedimentation systems. Based on this data, specific mill effluents were chosen for further laboratory study which showed that, using proper flocculating agents, soluble BOD removal could be increased markedly. Soluble BOD was defined as the organic load passing through a 0.45 micro m filter. Gel chromatography showed that low molecular weight biodegradable residues and colloidal materials were flocculated and removed. Also, studies using model compounds indicated that increased removal is apparently related to pH of the solution and chemical structure and solubility of the compound. Chemical costs may range from 3 cents to 10 cents per 1000 gal. It was concluded that costs can be reduced and clarifier performance can be improved by eliminating overflows and spills within the mill that result in inefficient sedimentation. (Majtenyi-IPA)
W79-01317

STATE-OF-THE-ART: MILITARY EXPLOSIVES AND PROPELLANTS PRODUCTION INDUSTRY, VOL. III -- WASTEWATER TREATMENT,
American Defense Preparedness Association, Washington, DC.
J. Patterson, N. I. Shapira, J. Brown, W. Duckert, and J. Polson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 042, Price codes: A09 in paper copy, A01 in microfiche. Report No. EPA-600/2-76-213c, October 1976. Vol. III of III, 181 p, 14 fig, 54 tab, 251 ref, 1 append. R-802872.

Descriptors: *Waste water treatment, *Industrial wastes, *Explosives, *Surveys, Evaluations, Pollution abatement, Water pollution, Waste water, Effluents, Solid wastes, Air pollution, Propellants, Trinitrotoluene, Water pollution sources, Nitroglycerin, Sellite, Acidic water, Technology.

A survey was conducted on the waste water treatment processes being used in the military explosives and propellants industry, including manufacturing, loading, assembly, and packing facilities. The effectiveness of various treatment technologies for water pollution abatement now in use or under investigation are described and evaluated as part of a long-term effort to modernize munitions production plants. The materials discussed include: trinitrotoluene (TNT), acetic acid and acetic anhydride, nitric acid, nitrocellulose, nitroglycerin, RDX (cyclotrimethylenetrinitramine) and HMX (cyclotetramethylenetetranitramine), sellite, and a variety of solvent and solventless propellants. Under each category, discussion is devoted to waste sources, current treatment practices, effects of water management, and modifications and alternatives to current practices. The effectiveness of pollutant removal is evaluated as well as secondary (air and solid) waste generation where appropriate. (Majtenyi-IPA)
W79-01318

RENOVATION OF INDUSTRIAL INORGANIC WASTEWATER BY EVAPORATION WITH INTERFACE ENHANCEMENT,
California Univ., Berkeley. Sea Water Conversion Lab.
H. H. Sephton.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 025, Price codes: A08 in paper copy, A01 in microfiche. Report No. EPA-600/2-76-017, March 1976. 67 p, 17 fig, 12 ref. R-802753.

Descriptors: *Waste water treatment, *Industrial waste, *Evaporation, *Surfactants, *Vertical tube evaporation(VTE), Interface enhancement, Powerplants, Boilers, Acid mine water, Waste water(Pollution), Crystallization, Foaming, Heat transfer, Optimization.

Improved heat transfer performance during concentration of industrial waste waters was obtained using a new method of vertical tube evaporation (VTE). This method, interface enhancement, relies on the addition of a few parts per million of a selected surfactant to waste water feed followed by imposed two-phase foamy liquid-vapor flow over the heat transfer surfaces. When applied to concentration of powerplant cooling tower blowdown and boiler blowdown, interface-enhanced VTE provided about 120% increase in usual heat transfer performance in pilot plant studies under realistic industrial conditions. When applied to acidic mine drainage water, concentrated by double-fluted titanium evaporator tubes, VTE provided about 60% performance improvement. Beneficial side effects of surfactant addition were inhibition of solute crystallization, permitting concentra-

tion of waste waters to smaller volumes. It was concluded that the interface-enhanced VTE process is technically feasible and economically attractive for application in the three waste water types investigated. (Majtenyi-IPA)
W79-01319

TREATMENT OF ELECTROPLATING WASTES BY REVERSE OSMOSIS,
Abcor, Inc., Wilmington, MA. Walden Research Div.
R. G. Donnelly, R. L. Goldsmith, K. J. McNulty, D. C. Grant, and M. Tan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 393, Price codes: A07 in paper copy, A01 in microfiche. Final Report No EPA-600/2-76-261, September 1976. 106 p, 50 fig, 16 tab, 11 ref. R-800945-01.

Descriptors: *Waste water treatment, *Industrial wastes, *Metallurgy, *Water pollution(Treatment), *Electrolysis, Osmosis, *Membrane processes, *Reverse osmosis, Semipermeable membranes, Metal plating, Membranes, Polymers, Cellulose acetate, Polyamide, Evaluation, Nickel, Copper, Zinc, Cadmium, Chromium, Pollution abatement.

Reverse osmosis treatment of plating bath rinse waters employing a closed-loop recycling of purified water for rinsing and return of plating chemical concentrate to the bath was examined and found to be an attractive process. Three commercially available membrane configurations were evaluated experimentally: tubular (cellulose acetate), spiral wound (cellulose acetate), and hollow (polyamide). At present, spiral wound and hollow fiber configurations are preferred because they are more compact and less expensive. Choice between the two is based primarily on the pH of rinse water concentrate, with cellulose acetate being preferred from pH 2.5 to 7 and polyamide from pH 4 to 11. Neither membrane has any overriding advantage in the overlap pH region. The degree to which the recycled plating chemicals would be concentrated and the degree to which rinse waters would be purified must be determined on a case by case basis depending on factors, such as the ratio of water loss from evaporation, maximum concentration limit obtainable by reverse osmosis, and required water purity. Of the rinse waste systems evaluated, chromic acid and very high pH cyanide baths were found to be unattractive for treatment using reverse osmosis. The following systems were determined to be attractive, with specified limitations: Watts-type nickel, nickel sulfamate, copper pyrophosphate, nickel fluoborate, zinc chloride, copper cyanide, zinc cyanide, and cadmium cyanide. (Majtenyi-IPA)
W79-01320

TREATMENT AND DISPOSAL OF COMPLEX INDUSTRIAL WASTES,
Reichhold Chemicals, Inc., Tuscaloosa, AL.
C. Schimmel, and D. B. Griffin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 979, Price codes: A09 in paper copy, A01 in microfiche. Final Report No EPA-600/2-76-123, November 1976. 190 p, 24 fig, 28 tab, 2 append. 12020 EGC.

Descriptors: *Industrial wastes, *Biological treatment, *Adsorption, *Activated carbon, *Waste water treatment, Oxidation, Water pollution, Temperature, Phenols, Chemical wastes, Chemical oxygen demand, Biological oxygen demand, Organic chemicals, Technology, Evaluation, Pilot plants, Waste disposal.

Using the Reichhold Chemicals, Inc. plant of Tuscaloosa, Alabama, as a model of a multi- product chemical facility, an effective biological treatment process was developed to handle both organic and inorganic wastes. The process produced a significant reduction in five day biological oxygen demand (BOD sub 5) loading, substantially complete removal of phenols, and adequate reduction in chemical oxygen demand (COD) loading. However, the biological process proved to be somewhat unreliable because of sensitivity to lower temperatures and changes in phenol concentration. As a result, an activated carbon adsorption process was developed, that resulted in average removal of 90% COD, 75% of BOD sub 5, and over 99% of phenol load in Reichhold plant wastes. It was concluded that biological oxidation should not be overlooked for treating industrial wastes although its usefulness is limited with respect to bacterial poisons, such as phenol, and ambient temperature changes that result in variable biological activity. However, carbon adsorption should not be considered if a substantial portion of the pollutant load is low molecular weight organics because they are poorly adsorbed or adsorbed not at all. (Majtenyi-IPA)
W79-01321

APOLLO COUNTY PARK WASTEWATER RECLAMATION PROJECT, ANTELOPE VALLEY, CALIFORNIA,
Los Angeles County Engineer Dept., CA.
H. T. Brandt, and R. E. Kuhns.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 997, Price codes: A06 in paper copy, A01 in microfiche. Final Report No EPA-600/2-76-022, March 1976. 341 p, 78 fig, 37 tab, 33 ref, 1 append. 17080 GCI and WRD 97-01-68.

Descriptors: *Waste water treatment, *Recreation, *Reclaimed water, *Water reuse, Water treatment, Tertiary treatment, Flocculation, Sedimentation, Filtration, Disinfection, Irrigation, Esthetics, Aquatic life, Fish environment, Parks, Recreation facilities, Conservation, Water resources, Evaporation, Soil quality.

The results of a full scale demonstration project on the economics and feasibility of reclaiming waste water for use at an aquatic park in a semi-arid area of California are presented. The project included construction of a 1900 cu m/day tertiary waste water treatment plant and a 22.7 ha (56-acre) park with recreational support facilities, and evaluation of the treatment system performance and water quality. The treatment process utilizes flocculation with alum, sedimentation, filtration, and disinfection to produce water that is pathogenically safe, esthetically pleasing, suitable for fish life and aquatic sports, and acceptable for irrigation use. However, because of high sodium levels and increases in boron and dissolved salts due to evaporation, precautions are needed to maintain soil quality, if used for irrigation. Also, because of an unforeseen natural soil condition, mercury concentrations in the fish exceeded limits set for human consumption. The completed Apollo County Park has been well accepted by the public and use was estimated at about 90,000 visitor days in the second year of operation. (Majtenyi-IPA)
W79-01324

EVALUATION OF ACTIVATED SLUDGE HYDRAULIC CONTROL TECHNIQUES THROUGH PILOT PLANT ANALYSES,
Purdue Univ., Lafayette, IN.
R. E. Roper.
Available from the National Tech
W79-01325

ECONOMIC ANALYSIS OF ALTERNATIVE SLUDGE DISPOSAL METHODS IN VERMONT,
Vermont Univ., Burlington. Dept. of Economics.
For primary bibliographic entry see Field 5E.
W79-01328

PROCEEDINGS OF A SYMPOSIUM ON LAND TREATMENT OF WASTE EFFLUENTS CENTER OF ADULT EDUCATION, UNIVERSITY OF MARYLAND, APRIL 25-26, 1978.
Maryland Univ., College Park. Water Resources Research Center.
Technical Report No. 48. 1978. 143 p. OWRT A-999-MD. (14).

Descriptors: Waste effluents, *Land treatment, Aerosol drift, Regulation, Monitoring instruments, *Waste water treatment, Water reuse.

The purpose of the symposium was to present results of research and case histories for systems of land treatment of waste effluents together with regulations or viewpoints of State and Federal regulatory and management agencies. Participants had the opportunity to talk with equipment and instrumentation exhibitors who were also on the program to discuss applications of different types of distribution equipment and monitoring systems. Participants represented engineers and scientists from consulting firms, manufacturing firms, municipal, county, state and federal agencies with responsibilities in research, design, planning, construction, equipment sales and service and system operators. Design criteria and the capabilities and limitation of soils to renovate water were discussed as was ecological impact. (Green -Maryland)
W79-01329

THE DEWATERING OF LIME-ALGAE SLUDGE ON SAND DRYING BEDS,
Mississippi State Univ., Mississippi State. Dept. of Civil Engineering.
M. T. Bond, and G. F. Mitchell.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 941, Price codes: A05 in paper copy, A01 in microfiche. Mississippi Water Resources Research Institute Report September 1978. 73 p, 45 fig, 2 tab, 13 ref, 2 append. OWRT A-110-MISS(1), 1434-0001-8026.

Descriptors: *Sludge treatment, *Dewatering, *Oxidation lagoons, *Algae, Sands, Filters, Waste water treatment, *Sand drying beds, *Lime-algae sludge.

Removal of algae from stabilization pond effluents is requred for the effluent to meet current federal discharge standards. Application of a thickened lime-algae sludge to sand drying beds was investigated as a treatment method. The sludge was loaded at rates of 4.0 to 16.1 gal/ft2 to sand bed columns with media depths of 6 to 12 inches. A sludge cake with an average 25% solid content was obtained within ten hours at bed depths of 6 to inches over the loadings applied, while 65 hours were required for a bed depth of 12 inches at loadings above 12 gal/ft2. Investigations indicated that dewatering rate and effluent quality were not related to media size from 0.3 to 1.5 mm. Dewatering rates decreased with increasing solids loading from about 1 to 6 lbs/ft2; however, effluent quality and sludge cake solids did not appear to be affectd by solids loading. Dewatering rates above 1 gal/ft2/hr were noted at a bed depth f 10 inches. Effluent suspended solids from the drying beds averaged 100 mg/1. Supernate withdrawal significantly decreased the dewatering time at the 12-inch bed depth; however, the supernate averaged 175 mg/1 of total suspended solids, which would require recirculation to the lagoon.
W79-01349

THE EFFECTIVENESS OF SAND FILTERS FOR THE REMOVAL OF SPECIFIC VIRUSES FROM WATER USING SELECTED CATIONS AS FILTER AIDS,
Auburn Univ., AL. Dept. of Civil Engineering.
S. R. Jenkins.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 044, Price codes: A05 in paper copy, A01 in microfiche. Alabama Water Resources Research Institute Auburn University, Bulletin 33, September 1978, 65 p, 18 fig, 2 tab. OWRT-B-065-ALA(1).

Descriptors: *Sand filters, Calcium, *Viruses, *Virus removal, Filters, Coliphoges, Filtration, Waste water treatment, *Volumetric analysis, *E. coli.

Calcium was shown to enhance the removal of T1 coliphage by model rapid sand filters. The concentration of calcium necessary to cause effective removal of the virus was stoichiometric with the virus titer. The effectiveness of the one-inch ID 4-inch deep model to remove T1 coliphage in the presence of calcium decrease 2+ as the sand grain size increased and as the filtration rate increased. Ca 2+ enhanced removal most effectively at

slightly acid pH's. That is, more Ca2+ is required to produce effective removal of the virus as the pH is raised. Alkametric titration curves were unreliable for determining the extent of complexation between the Ca2+ and the T1 coliphage. The titration curves indicated that the beef extract broth and the host cell Escherichia Coli also complexed with the Ca. Isolation of the virus particles would necessary for more conclusive results.
W79-01352

WATER QUALITY AND CONTROL OF PLANT PATHOGENS IN IRRIGATION REUSE,
Nebraska Univ., Lincoln. Dept. of Civil Engineering.
R. W. Bay.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 985, Price codes: A06 in paper copy, A01 in microfiche. MS Thesis, December 1977. 108 p, 20 fig, 4 tab, 20 ref, 2 append. OWRT B-032-NEB(1), 14-34-0001-6096.

Descriptors: *Irrigation, *Biological pollution, *Water reuse, *Disinfection, *Water quality, Chlorine, Runoff, Crops, Pathogenic bacteria, On-site testing, Laboratory tests, Ammonia, Nitrogen compounds, Hydrogen ion concentration, Corn, Beans, Xanthomonas phaseoli, Corynebacterium nebraskense, Plant diseases, Blights, Bioassay, Water analysis, Sampling.

The characteristics of typical reuse irrigation water were defined with emphasis on parameters such as, ammonia nitrogen, organic matter, and pH, which can affect chlorination needed to control phytopathogenic organisms. Samples collected throughout Nebraska were tested in the field and laboratory for nitrate plus nitrite nitrogen, orthophosphate, total hardness, alkalinity, and turbidity. Samples were collected also for greenhouse bioassay to identify the phytopathogens present. The pH levels of reuse water from 6.3 to 8.6 covered a critical range affecting the disinfection efficiency of chlorine. Organic plus ammonia nitrogen was found at levels up to 10 mg/l and interfered with chlorine by reacting with chlorine to form chloramines having weak disinfection capabilities. The phytopathogenic organisms tested for chlorination sensitivity were Xanthomonas phaseoli which causes blight of dry edible beans and Corynebacterium nebraskense, which causes Goss's wilt disease of corn. Both these organisms needed only low levels of chlorine for disinfection. Below pH 8, 0.01 to 0.02 mg/l residual free chlorine produced 99% kill after 5 minutes contact. At pH 8.5, 1 to 2 mg/l were needed for the same effect. It was concluded that chlorination of irrigated reuse water is feasible if high levels of ammonia nitrogen are not present. (Majtenyi-IPA)
W79-01358

RECOVERY AND REUSE OF PAINT SOLIDS FROM WASTE WATER,
Drew Chemical Corp., Booton, NJ. (Assignee).
T. P. Brennan.
U.S. Patent No. 4,096,061, 2 p, 7 ref; Official Gazette of the United States Patent Office, Vol 971, No 3, p 1121, June 20, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Water purification, Separation techniques, Flocclation, Cations, Chemical reactions, Paints, Product recovery.

A latex base paint waste water containing dispersed paint solids is clarified by flocculating the paint solids with a cationic flocculant. The cationic flocculant is generally a polymer, and in particular, a polyamine or a polyvinylimidazoline. The separation paint sludge is brought to an alkaline pH and treated with an anionic dispersing agent whereby the sludge can be used in the formulation of a latex base paint. The anionic dispersant is added in an amount sufficient to neutralize the effect of the previously added cationic flocculant. (Sinha-OEIS)
W79-01391

METHOD AND DEVICE FOR SEPARATION OF SUSPENDED MATERIAL FROM A FLUID FLOW,
Paraisten Kalkki Oy, Pargas (Finland). (Assignee).
B. Myreen, and U. Nylund.
U.S. Patent No. 4,096,062, 7 p, 4 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 971, No. 3, p 1121, June 20, 1978.

Descriptors: *Patents, *Water purification, *Waste water treatment, *Water pollution treatment, Suspended load, Separation techniques, Sedimentation, Filtration, Flow rates, Flow separation, Equipment.

Suspended solid particles are separated from a fluid flow (or water) by dividing the flow into partial fluid flows in flow channels having an upper filter surface travelling upstreams and a lower filer surface travelling downstreams, controlling the flow velocity in the channels such that the flow is turbulent but at the same time low enough to allow for sedimentation of the suspended material to form a clear top layer off so that more than half of the liquid fed to the channel is filtered through the upper filter surface, suctioning less than half of the liquid fed into the channel through a sediment formed on the lower filter surface, and finally removing the sediment from the lower surface. (Sinha-OEIS)
W79-01392

WATER STERILIZATION APPARATUS,
Sachs-Systemtechnik G.m.b.H., Schweinfurt (Germany, F.R.).
For primary bibliographic entry see Field 5F.
W79-01395

PROCESS FOR THE PURIFICATION OF INDUSTRIAL EFFLUENTS,
Ciba-Geigy Corp., Ardsley, NY. (Assignee).
H. Wegmuller, and J. Haase.
U.S. Patent No. 4,097,376, 9 p, 12 ref; Official Gazette of the United States Patent Office, Vol 971, No 4, p 1558, June 27, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water pollution treatment, Bleaching wastes, Separation techniques, Filtration, Absorption, Color, Cellulose, Pulp and paper industry, Water reuse.

A process for the purification of industrial effluents, especially for the decolorization of waste liquors arising in the textile, paper and leather industry, is characterized in that the effluents are brought into contact with cellulosic absorbent which has been pretreated with precipitants. Preferably filters of cellulose itself or of waste sheets from printing are used. Suitable precipitants are water-soluble basic aminoplasts such as formaldehyde-dicyandiamide condensation products. (Sinha-OEIS)
W79-01396

METHOD OF PURIFICATION OF WASTE WATER BY TREATMENT WITH ZIRCONIUM SALT,
Shikoku Paper Mfg. Co., Ltd., (Japan). (Assignee).
B. Ayukawa.
U.S. Patent No. 4,097,377, 11 p, 6 ref; Official Gazette of the United States Patent Office, Vol 971, No 4, p 1558, June 27, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water purification, Coagulation, Chemical precipitation, Separation techniques, Color, Pulp and paper industry, *Zirconium salts treatment.

A method for purification of water in which soluble octavalent polymer cation forming water soluble zirconium salts are used to coagulate and precipitate suspended substances and colloidal dispersed particles as well as non-colloidal dissolved organic and inorganic substances in waste water is described. Suspended substances and colloidal dispersed particles are removed as well as non-colloidal dissolved low molecular organic substances in the waste water derived from chemical pulping and paper mills so that oxygen demand and color are minimized and transparency is maximized in one process. (Sinha-OEIS)
W79-01397

MULTIPLE EFFECT EVAPORATION OF WATER FROM WATER CONTAINING COMBUSTIBLE SLUDGES,
For primary bibliographic entry see Field 5E.
W79-01398

SEPTIC TANK-LEACHING POOL ARRANGEMENT,
Scotto (Anthony J.), Smithtown, NY. (Assignee).
K. Carlson.
U.S. Patent No. 4,097,380, 6 p, 5 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 971, No 4, p 1559, June 27, 1978.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, *Septic tanks, Domestic wastes, Leaching, Subsurface drainage, Equipment.

The septic tank is provided with a cylindrical portion made of precast concrete which has a support ring for mounting the septic tank on the upper wall edge of a leaching pool. The cylindrical portion defines a chamber for the storage of the raw sewage and in which the sewage is acted upon in a conventional anaerobic reaction, and which has an inlet baffle, and an outlet baffle positioned diametrically opposite to the inlet baffle to allow for the maximum flow path between them. The septic tank extends downwardly into a cistern or leaching pool and defines an annular space. The septic tank and support have respective outlet openings for the flow of liquid from the tank into the cistern. (Sinha-OEIS)
W79-01399

METHOD OF TREATING WASTE WATER WITH ACTIVATED SLUDGE,
Idemitsu Kosan Co. Ltd., Tokyo (Japan). (Assignee).
Y. Kobayashi, M. Iwata, S. Yoshida, and H. Akatsuka.
U.S. Patent No. 4, 098,689, 7 p 4 fig, 6 tab, 6 ref; Official Gazette of the United States Patent Office, Vol. 972, No 1, p 254, July 4, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Activated sludge, Aeration, Sea water, Biochemical oxygen demand.

Sea water is fed to waste water in operating an activated sludge process. Sea water can be added before or after the waste water is introduced into the aeration tank. The sea water can be fed continuously during operation or intermittently depending upon the total salt concentration of the waste water. Treatment is carried out as long as salt concentration ranges from 0.3 to 0.5 weigh percent. Feeding of sea water is stopped or decreased when the removal rate of BOD in the treated water begins to fall. (Sinha - OEIRS)
W79-01403

WATER PURIFICATION PROCESS,
Illinois Univ. Foundation at Urbana-Champaign. (Assignee).
M. J. Semmens.
U.S. Patent No. 4,098,690, 7 p, 3 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 972, No 1, p 254, July 4, 1978.

Descriptors: *Patents, *Waste water treatment, *Water purification, *Water pollution treatment, *Ion exchange, Separation techniques, Ammonia, Nitrogen fixing bacteria, Ion exchangers, Regeneration.

The invention relates to the removal of ammonia from water by ion exchange and the regeneration of the ammonia containing ion exchange material by use of nitrifying bacteria. Wastewater containing ammonia is first passed through an ion ex-

change unit which has a preferential affinity for ammonium ions. The spent ion exchanger is taken out of service for regeneration. Regeneration may be accomplished in either of two ways. The ion exchanger may be contacted with a brine containing a high concentration of nitrifying in which technique, exchange and nitrification occur simultaneously. Or the ion exchanger may be exposed to the brine only, and the resultant ammonia containing brine is then nitrified in a separate unit before being recycled. (Sinha-OEIS)
W79-01404

PURIFICATION OF WATER FOR BOILER,
Department of Energy, Mines and Resources, Ottawa (Ontario).
For primary bibliographic entry see Field 5F.
W79-01405

CATIONIC CHLORINE-RESISTANT POLYMERIC FLOCCULANTS AND THEIR USE,
Betz Labs., Inc., Trevose, PA. (Assignee).
R. G. Tonkyn, and N. Vorchheimer.
U.S. Patent No. 4,098,693, 4 p, 3 tab, 9 ref; Official Gazette of the United States Patent Office, Vol 972, No 1, p 255, July 4, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water pollution treatment, Flocculation, Chemical reactions, Organic compounds, Polymers.

Cationic, chlorine-resistant polymeric materials, useful as flocculants, are prepared by reacting an epihalohydrin with a mixture consisting of a lower di-alkylamine and ammonia, where the ammonia level is from about 15% to about 33% of the total molar amount of the ammonia-amine combination, and the ratio of the epihalohydrin to the combination is at least 0.9. The flocculants of this invention are effective in clarifying aqueous systems containing undesirable particulate matter, and are compatible with the conventional flocculating agents, such as alum, clay, and iron salts. They are chlorine-resistant since substantially all of the nitrogen atoms in the polymer are quaternized. The polymer itself is cationic, with one positive charge per nitrogen group, and is in electrical balance with the equal number of halogen anions present. (Sinha-OEIS
W79-01406

METHODS AND COMPOSITIONS FOR DISPERSING OIL FILMS,
United States Steel Corp., Pittsburgh, PA. (Assignee).
For primary bibliographic entry see Field 5G.
W79-01407

APPARATUS FOR REMOVING MERCURY FROM WASTE WATER,
Sobin Chlor-Alkali, Inc., Orrington, ME. (Assignee).
P. DeAngelis, A. R. Morris, and A. L. MacMillan.
U.S. Patent No. 4,098,697, 6 p, 1 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 972, No 1, p 256, July 4, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Industrial wastes, mercury, Filtration, Coals, Filters, Anthracite coal, Regeneration, *Mercury recovery.

A method for removing mercury from water contaminated with mercury comprises contacting the water with finely divided anthracite coal. The mercury laden water can first be treated with sodium borohydride to reduce dissolved mercury to the metallic form. The water treated with reducing agent, is filtered through a pressure leaf filter coated with a filter aid, contacted with anthracite coal and contacted with chelating resin. It has been discovered that finely divided anthracite coal is not merely the equivalent of other filtering agents but actually removes finely divided metallic mercury from contaminated water even when water has been previously filtered using conventional filtration techniques. The finely divided anthracite coal can be regenerated by simply distilling the mercury by heating the anthracite or dissolving out the mercury with chlorine containing water or hydrochloric acid. (Sinha-OEIS)
W79-01408

LOW TURBULENCE SETTLING TANK,
Magna International Inc., Downsview (Ontario). (Assignee).
D. J. Harding.
U.S. Patent No. 4,098,699, 12 p, 10 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 972, No 1, p 257, July 4, 1978.

Descriptors: *Patents, *Waste water treatment, *Water purification, *Water pollution treatment, Suspended solids, Sedimentation, Separation techniques, Settling basins, Water reuse, Equipment, Tar sands extraction process.

The settling tank of this invention is particularly useful for separating fine silt and clay from the watery effluent which is produced by a tar sands extraction process. By the use of a continuous process, it is possible to dispose of the solids through a system of re-inserting the solids into the extracted tar sands where they can be returned to the excavation site. Continuous operation of the separation process also makes possible recycling the water from extraction discharge back into the extraction step. The specification discloses a settling tank system adapted for low-turbulence settling of solids from water comprising a circular tank for retention of water during settling and a radial boom provided at the level of the surface of water for rotation around a central hub. A uniform and non-turbulent supply of solids-containing water and a non-turbulent removal of cleared water is at a equal rate. (Sinha-OEIS)
W79-01409

METHOD OF TREATMENT OF AN OXIDIZABLE MATERIAL BY A BIOCHEMICAL PROCESS,
Societe Anonyme Pour L'Etude et L'Exploitation des Procedes Georges Claude, Paris (France). (Assignee).
P. Boulenger, N. Angelier, and J. P. Torres.
U.S. Patent No. 4,100,062, 35 p, 24 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 972, No 2, p 714, July 11, 1978.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Industrial wastes, Water purification, *Biological treatment, Oxygen, Oxygenation, Gases, Bubbles, Mixing, Equipment.

A method of biochemical treatment which finds particular application to the biological processing of waste or sewage water takes place in an oxygenation zone and comprises the following operations: In a first step an oxygenation gas consisting of more than 50% by volume of oxygen, is supplied into the water in the form of bubbles. In a second step the gaseous atmosphere is placed in contact with the water by the use of mechanical means. These steps are repeated as long as the mean rate of flow of oxygenation gas to the oxygenation zone corresponds substantially to the consumption of oxygen. (Sinha-OEIS)
W79-01412

METHOD AND APPARATUS FOR THE BIOLOGICAL CLEANSING OF WASTE WATER,
Maschinenfabrik Hellmut Geiger, Karlsruhe (West Germany). (Assignee).
L. Hartmann.
U.S. Patent No. 4,100,063, 5 p, 2 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 972, No 2, p 715, July 11, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Water purification, *Biological treatment, Filtration, Aeration, Filters, Trickling filters.

The invention provides an improved method and apparatus for a percolating-type waste water filter in which the operation of the filter can be controlled and in which, in a relatively small space, a large quantity of waste water can be processed. The percolating-type filter is charged with waste water and air and the biological mass is mechanically removed from the growing surface before it can loosen itself biologically and/or physically. This is advantageous since the biological mass is densified and the conventional sedimentation step can be completely or at least partially spared. (Sinha-OEIS)
W79-01413

METHOD FOR REMOVING OF MULTIVALENT HEAVY METALS FROM METAL PLATING WASTE EFFLUENTS,
Purdue Research Foundation, Lafayette, IN. (Assignee).
J. E. Etzel.
U.S. Patent No. 4,100,065, 6 p, 6 tab, 3 ref; Official Gazette of the United States Patent Office, Vol 972, No 2, p 715, July 11, 1978.

Descriptors: *Patents, *Waste water treatment, Industrial wastes, Water pollution treatment, Separation techniques, *Ion exchange, *Heavy metals, *Cation exchange, Recycling, Exfoliated vermiculite, *Metal plating wastes.

An exfoliated vermiculite cation-exchange column is used to remove multivalent heavy metals (copper, zinc, nickel, chromium, etc) from metal plating wastes. The exfoliated vermiculite may be either chemically or relatively low-temperature thermally expanded vermiculite ore. It preferably has a cation exchange capacity of over 80 meq/100g. Exfoliated vermiculite particle sizes of less than approximately 10 mesh are preferred as the column packing. The ion-depleted vermiculite from the exchange column after use can be further expanded thermally and used as a lightweight filling material. (Sinha-OEIS)
W79-01415

TREATING PAINT WASTE SOLIDS,
Carrier Drysys Ltd., London (England). (Assignee).
I. Bloomer, and R. W. Young.
U.S. Patent No. 4,100,066, 11 p, 4 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 972, No 2, p 715-716, July 11, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Industrial wastes, Separation techniques, Scum, *Paints(Wastes), Equipment, Flotation.

A method and apparatus of collecting and disposing of waste paint solids contained in an aqueous medium which flows from a paint spraying booth into a container located beneath the booth or contained in scum on the surface of aqueous medium delivered from the water container into a flotation tank outside the booth comprises the steps of: flowing paint laden aqueous medium from the water container or scum into the lower portion of a vessel located outside the booth; retaining the aqueous medium in the vessel for a residence time sufficient to permit paint solids to accumulate as a raft on the surface of the water in the vessel; and causing the accumulated paint solids to flow from an outlet at the upper portion of the vessel into a container by applying fluid pressure to the raft. (Sinha-OEIS)
W79-01416

APPARATUS FOR USE IN WATER PURIFICATION PARTICULARLY SEWAGE TREATMENTS,
Filters International, Inc., Chicago, IL. (Assignee).
E. B. White, and M. N. Sharma.
U.S. Patent No. 4,100,070, 25 p, 11 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 972, No 2, p 717, July 11, 1978.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, Flocculation, Biological treatment, Filtration, Adsorption, Chemical precipitation, Chemicals.

An apparatus for treatment of sewage and waste materials is particularly desirable for relatively small installations and utilizes high rate biochemical oxidation/physio-chemical adsorption, in which the sewage is subjected to a primary biological treatment, and a secondary settling treatment. The primary-secondary effluent, following addition of an organic-inorganic chemical material comprising prereacted floc, a phosphate precipitating material and a nonionic polyelectrolyte, operative to maintain pH and zeta potential favorable to flocculation, is subjected to a tertiary treatment by passage through a mixed filtration and adsorption bed containing activated carbon. The mixed bed is periodically regenerated by a partial wet-gas oxygenation cycle, utilizing a reflex operation in which the products of regeneration are returned to the primary treatment. The chemicals are produced as a dry honogeneous discrete material which may be readily transported and handled in dry form, and formed into an aqueous mix or slurry at time of ultimate use. (Sinha-OEIS)
W79-01418

WASTE-WATER TREATMENT SYSTEM,
F. J. Hofcroft.
U.S. Patent No. 4,100,073, 4 p, 5 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 972, No 2, p 718, July 11, 1978.

Descriptors: *Patents, *Wastewater treatment, *Water pollution treatment, *Domestic wastes, Septic tanks, Anaerobic conditions, Filters, Disinfection, Environmental sanitation.

A wastewater treatment system is provided for use in treating the sanitary and grey waste waters from individual homes in areas where subsurface disposal of these wastes is not feasible and where discharge of treated effluent to a body of surface water is permitted. All toilet wastes, bath and shower wastes, and kitchen wastewater can be treated by this process and system. These wastes are cleansed, disinfected and clarified prior to discharge to the receiving body of water. The system includes a septic tank, a dosing chamber, an enclosed sand filter, and a disinfection unit operatively connected to one another for progressive cleansing, clarification and disinfection of the wastewater. (Sinha-OEIS)
W79-01420

WASTEWATER RECYCLING ON FOREST LANDS,
Pennsylvania State Univ., University Park. School of Forest Resources.
W. E. Sopper.
Pennsylvania Institute for Research on Land and Water Resources Reprint Series No. 39 (reprinted from Forest Soils and Forest Land Management, Proceedings 4th N.A. Forest Soils Conf., Laval University, Quebec, Aug. 1973) 16 p, 7 tab, 9 ref. OWRT B-047-PA(4), 14-31-0001-3639.

Descriptors: *Water reuse, Sewage disposal, Sewage treatment, Sludge disposal, Sludge treatment, Treatment facilities, Wastewater disposal, Wastewater treatment, Water conservation, Municipal wastes, Agronomy, Forests, Golf courses, Recycling, *Living filter system, *Revegetate bituminous spoil banks, Renovation, Agricultural land, Forest preserves.

Ten years of research have indicated that the living-filter system for renovation and conservation of municipal wastewater is feasible and that combinations of agronomic and forested areas provide the greatest flexibility in operation. Such a system is more adaptable to small cities and suburbs than to large metropolitan areas because of the availability of open land close to the wastewater treatment plant, although the land area requirement is not a major prohibitive factor. At an application rate of 5 cm per week, only 52 ha of land would be required to dispose of 4 million liters of wastewater per day. Although large contiguous blocks of agricultural and natural forest land would be the most desirable for efficiency and economy, major metropolitan areas could utilize golf courses, playing fields, forest preserves and parks, greenbelts, scenic parkways, and perhaps even divided highway and beltway medial strips. Results also indicate that municipal wastewaters might be used to reclaim and revegetate many of the barren bituminous strip-mined spoil banks existing throughout the Appalachian region and restore them to a more esthetic and productive state. (Sink-Penn State)
W79-01424

SYNTHESIS OF OPTIMAL FEEDBACK CONTROL SYSTEMS FOR FERMENTATIONS AND BIOLOGICAL WASTE TREATMENT PROCESSES,
Kansas State Univ., Manhatten. Dept. of Chemical Engineering.
L. T. Fan, P. S. Shah, and L. E. Erickson.
In: Proceedings, Fourth International Fermentation Symposium: Fermentation Technology Today. p 1167-177, 1972, 7 fig, 53 ref. Kansas Water Resources Research Institute Contribution No. 89. OWRT A-045-KAN(6), 14-31-0001-3516.

Descriptors: Dynamics, Proportional control, *Fermentation, *Waste water treatment, Waste treatment, *Control, *Optimal feedback control, *Biological treatment.

The control of growth processes in fermentations and biological waste treatment systems was examined using optimal feedback control theory. The objectives of control actions were to maintan the desired productivity in a chemostat and to sustain uniform effluent quality in a biological waste treatment process. It was assumed that the content of the aeration vessel was completely mixed in both cases. The Monod model was employed to represent growth in the chemostat; however, an endogenous metabolism term was added for biological waste treatment. Uses of proportional control and proportional plus integral control were considered for the biological waste treatment process. The results showed that optimal feedback control can significantly reduce the time required for the process to return to the desired state following a disturbance.
W79-01428

POLLUTION ABATEMENT FACILITIES AT NATIONAL FISH HATCHERIES,
Fish and Wildlife Service, Portland, OR.
For primary bibliographic entry see Field 5G.
W79-01463

EVALUATION OF CLINOPTILOLITE FOR AMMONIA REMOVAL,
Kramer, Chin, and Mayo, Inc., Seattle, WA.
W. G. Williams.
In: Proceedings of the Northwest Fish Culture Conference, 25th Anniversary, Dec. 4-6, 1974, p 94-100, 2 tab, 2 fig.

Descriptors: *Ammonia, *Nutrients, Nitrogen, Nitrogen compounds, Methodology, *Aquiculture, *Fish hatchery, Oxygen, Biological oxygen demand, Fish physiology, Clinoptilolite, Ammonia Removal, Ammonia production, Fish handling facilities, Waste water treatment, Waste removal.

A system was designed that utilizes a high rate sand filter for removal of suspended organic solids, followed by an ion-exchange bed for the removal of ammonia. The ion-exchange material selected was 'clinoptilolite' a zeolite material that exchanges sodium ion for ammonia. The results of tests with this system designed for waste removal in a fish hatchery are given. (EIS-Katz)
W79-01464

5E. Ultimate Disposal Of Wastes

ADDITION OF POTATO PROTEIN RECOVERED FROM POTATO STARCH FACTORY WASTE EFFLUENTS FOR BREAD,
T. Fukui.
Nippon Shokuhin Kogyu Gakkai-Shi, Vol. 25, No. 1, p 43-46, 1978. 6 fig, 2 tab, 4 ref.

Descriptors: *Proteins, *Potatoes, *Nutrient removal, *Reverse osmosis, *Recycling, *Industrial wastes, Food processing industry, Ultimate disposa, Waste water treatment, Waste water disposal.

Protein recovered from potato starch manufacturing effluents by reverse osmosis was evaluated as an additive for commercial bread baking. Data on the taste, flavor, specific volume, grain, and softness of breads containing various concentrations of potato protein flour was analyzed by factor analysis using an orthogonal L(16) design with four factors, taken two or three at a time. Analysis of variance indicated that the optimum ratio for breadmaking in terms of the finished product would be 2-6 parts of potato protein flour to 100 parts of wheat flour. (Schulz-FIRL)
W79-01073

SEWAGE FROM THE YEAST INDUSTRY: ITS NATURE AND ITS PURIFICATION (ABWASSER DER HEFEINDUSTRIE, BESCHAFFENHEIT UND REINIGUNG),
For primary bibliographic entry see Field 5D.
W79-01075

WATER CONTENT REDUCTION OF METAL-PLATING WASTE SLUDGE BY A PRESS AND CENTRIFUGE (MEKKI SURAJI NO KOKAITEKI DASSUI NI KANSURU KISOTEKI KENKYU),
E. Oi.
Kogai, Vol. 13, No. 4, p 9-14, 1978. 6 fig, 2 tab, 8 ref.

Descriptors: *Dewatering, *Centrifugation, *Sludge treatment, *Filters, *Industrial wastes, Metals, Clays, Separation techniques, Pressure, Compaction.

A press and a centrifuge were tested for their abilities to dewater metal plating waste sludges containing colloidal metal hydroxides. The centrifuge was operated at 120, 400, and 1100 G's over 0-30 min; the press was operated at pressures of 1-40 kg/sq m. The press was cited as more efficient than the centrifuge; the final water content of the sludge was related in a power formula to the initial water content and the applied pressure. Limits imposed by plasticity on the water of aluminum hydroxide and nickel hydroxide sludges were 2.14 and 1.40, respectively. (Schulz-FIRL)
W79-01082

CHARACTERISTICS OF INCINERATOR RESIDUE AND THE EFFECT OF ITS LEACHATE ON GROUNDWATER QUALITY,
Connecticut Univ. Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 5B.
W79-01090

DIRECT INJECTION OF RECLAIMED WATER INTO AN AQUIFER,
Stanford Univ., CA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W79-01108

THE IMPACT OF HAZARDOUS WASTES ON GROUND WATER: PART II,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 5B.
W79-01113

CADMIUM AVAILABILITY TO RICE IN SLUDGE-AMENDED SOIL UNDER 'FLOOD' AND 'NONFLOOD' CULTURE,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
F. T. Bingham, A. L. Page, R. J. Mahler, and T. J. Ganje.
Soil Science Society of America Journal, Vol. 40, No. 5, p 715-719, Sept.-Oct. 1976. 6 fig, 4 tab, 10 ref. (California Water Resources Center Project

UCAL-WRC-W-420).

Descriptors: *Sludge disposal, *Sludge, *Cadmium, *Heavy metals, *Rice, Waste disposal, Soil treatments.

Rice plants (Oryza sativa var. 'Colusa') were grown to maturity in pots containing a soil amended with 1% sewage sludge enriched with variable amounts of CdSO4 ranging up to 640 microgram Cd/g). Two sets of soil cultures were used; one for rice under continuous flood and the other under nonflood conditions. Grain production for rice under flood management was relatively unaffected by the Cd treatment. 25% yield decrement was associated with a treatment of 320 microgram Cd/g. Under nonflood management, however, a comparable decrement in grain production was observed with a treatment of only 17 microgram Cd/g. The Cd content of mature leaves at early flowering varied from approximately 0.3 microgram Cd/g for the controls to 2.8 microgram Cd/g for plants receiving the highest Cd treatments. Leaf Cd values were slightly higher under the nonflood culture. The Cd content of the grain under nonflood management was approximately 55% greater than that of grain under flood management. The Cd content of mature leaves correlated with grain production for rice produced under either flood or nonflood culture. Chemical analysis of saturation extracts revealed greatly reduced Cd concentrations in soil solutions under flood management which may account for the greater tolerance of the cultivar to soil Cd under flood culture. This reduced availability of Cd in flooded soils is attributed to precipitation of CdS. (Snyder-Calif, Davis)
W79-01127

ON THE MECHANISMS OF CO2 AND CH4 PRODUCTION IN NATURAL ANAEROBIC ENVIRONMENTS,
Indiana Univ. at Bloomington. Dept. of Chemistry; Indiana Univ. at Bloomington. Dept. of Geology; and Indiana Univ. at Bloomington. Water Resources Research Center.
For primary bibliographic entry see Field 5C.
W79-01135

IN PURSUIT OF CLEAN OCEANS - A REVIEW OF THE MARINE PROTECTION, RESEARCH, AND SANCTUARIES ACT,
Naval Facility Engineering Command, San Bruno, CA. Western Div.
For primary bibliographic entry see Field 5G.
W79-01144

UNDERGROUND INJECTION PROGRAM SET UNDER SAFE DRINKING WATER ACT,
New Mexico State Univ., University Park. School of Engineering.
For primary bibliographic entry see Field 5G.
W79-01154

TRANSFORMATIONS OF HEAVY METALS AND PLANT NUTRIENTS IN DREDGED SEDIMENTS AS AFFECTED BY OXIDATION REDUCTION POTENTIAL AND PH, VOLUME II: MATERIALS AND METHODS/RESULTS AND DISCUSSION,
Louisiana Agricultural Experiment Station, Baton Rouge.
For primary bibliographic entry see Field 5C.
W79-01201

QUABOAG AND QUACUMQUASIT PONDS, WATER QUALITY STUDY, APRIL 1974-APRIL 1975,
Massachusetts Water Resources Commission, Westborough. Div. of Water Pollution Control.
For primary bibliographic entry see Field 5C.
W79-01202

WASTE SOURCE INVESTIGATIONS, KINGSPORT, TENNESSEE.
National Field Investigations Center-Denver, CO.; and Environmental Protection Agency, Atlanta, GA. Region IV.
For primary bibliographic entry see Field 5B.
W79-01208

EFFECT OF SOIL APPLICATION OF DAIRY MANURE ON GERMINATION AND EMERGENCE OF SOME SELECTED CROPS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5C.
W79-01236

YIELD AND CADMIUM ACCUMULATION OF FORAGE SPECIES IN RELATION TO CADMIUM CONTENT OF SLUDGE-AMENDED SOIL,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5C.
W79-01237

GEOCHEMISTRY OF MERCURY IN PALOS VERDES SEDIMENTS,
Southern California Coastal Water Research Project, El Segundo, California.
For primary bibliographic entry see Field 5B.
W79-01250

GROWTH AND CADMIUM ACCUMULATION OF PLANTS GROWN ON A SOIL TREATED WITH A CADMIUM-ENRICHED SEWAGE SLUDGE,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5C.
W79-01282

EFFECT OF BEEF-FEEDLOT-LAGOON WATER ON SOIL CHEMICAL PROPERTIES AND GROWTH AND COMPOSITION OF CORN FORAGE,
Kansas State Univ., Manhattan. Dept. of Agronomy.
For primary bibliographic entry see Field 5C.
W79-01290

AN ASSESSMENT OF TECHNOLOGY FOR POSSIBLE UTILIZATION OF BAYER PROCESS MUDS,
Battelle Memorial Inst., Columbus, OH.
For primary bibliographic entry see Field 5D.
W79-01315

AUTOMATED TREATMENT AND RECYCLE OF SWINE FEEDLOT WASTEWATERS,
Ohio State Univ., Columbus.
For primary bibliographic entry see Field 5D.
W79-01316

TREATMENT AND DISPOSAL OF COMPLEX INDUSTRIAL WASTES,
Reichhold Chemicals, Inc., Tuscaloosa, AL.
For primary bibliographic entry see Field 5D.
W79-01321

FEASIBILITY STUDY, FLY ASH RECLAMATION OF SURFACE MINES, HILLMAN STATE PARK, FEASIBILITY STUDY,
Ackenheil and Associates Geo Systems, Inc., Pittsburgh, PA.
For primary bibliographic entry see Field 5G.
W79-01323

ECONOMIC ANALYSIS OF ALTERNATIVE SLUDGE DISPOSAL METHODS IN VERMONT,
Vermont Univ., Burlington. Dept. of Economics.
R. G. Fritz.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 920, Price codes: A06 in paper copy, A01 in microfiche. Vermont Water Resources Research Center, Technical Completion Report. June 30, 1978. 99 p, 4 fig, 7 tab, 19 ref. OWRT A-031-VT(1), 14-34-0001-7096.

Descriptors: Sludge, *Sludge disposal, *Land disposal of sludge, Wastewater sludge, Organic fertilizers, Sludge burial, Costs of disposal, Small communities, Regional cooperation, Sludge treatment and processing, Economic analysis, *Waste disposal, *Alternative planning.

Information is provided on the costs of municipal sewage sludge disposal in Vermont. Specific objectives were to determine the costs of two methods of disposal, landfill and landspreading; determine factors which influenced disposal costs; determine the economic benefits of landspreading disposal; and designing a regional plan for sludge disposal. The data were obtained by use of three survey questionnaires. The first, used in interviews with operators of twenty wastewater treatment plants, gathered information on sludge disposal practices and the costs associated with these practices. Two additional questionnaires were used to survey current and potential users of sludge to provide information concerning landspreading practices and costs. There was no indication that either method of disposal, was less expensive than the other. An analysis of variance indicated, however, that per capita disposal costs associated with the use of flotation thickeners and vacuum filters were significantly higher than those associated with liquid and sand drying bed dewatered sludge disposal. Total costs of liquid sludge disposal were much more responsive to changes in distances to disposal sites than were total costs associated with dewatered sludge disposal. Other factors, especially weather, were often more important than economic considerations in choosing a disposal method. The nutrient value of sludge when used as a fertilizer supplement was $34.60 per ton in 1976. The sale of sludge has potential for communities to recover portions of sludge disposal costs. An initial evaluation of regional efforts to manage and dispose of sludge was carried out. Evidence indicates that increased regional efforts may reduce disposal costs and facilitate increased landspreading. One specific regional approach was put forward.
W79-01328

PROCEEDINGS OF A SYMPOSIUM ON LAND TREATMENT OF WASTE EFFLUENTS CENTER OF ADULT EDUCATION, UNIVERSITY OF MARYLAND, APRIL 25-26, 1978.
Maryland Univ., College Park. Water Resources Research Center.
For primary bibliographic entry see Field 5D.
W79-01329

CARBON AND NITROGEN TRANSFORMATIONS IN SOILS AMENDED WITH SEWAGE SLUDGE,
Purdue Univ., Lafayette, IN.
For primary bibliographic entry see Field 5C.
W79-01350

MULTIPLE EFFECT EVAPORATION OF WATER FROM WATER CONTAINING COMBUSTIBLE SLUDGES,
J. C. St. Clair.
U.S. Patent No. 4,097,378, 6 p, 1 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 971, No 4, p 1558, June 27, 1978.

Descriptors: *Patents, *Sludge treatment, *Sludge disposa, *Waste disposa, *Separation techniques, Evaporation, Condensation, Solid wastes, Equipment, Energy conservaton.

The object of this invention is to provide a low cost method for removing water from peat, garbage, sewage sludges and other combustible water containing sludges in low cost equipment so they can be burnt, thermally decomposed or hydrogenated to valuable materials. Water containing combustible sludges are dried with the multiple effect use of the heat required by adding recycled cool high boiling oil and heating the mixture by direct contact with steam produced as later described.

Then the oil sludge mixture has water separated off which is possible, since water has been added by the direct condensation of steam in the heating of the mixture plus any extra original water in the sludge that can be removed by a centrifuge. The mixture is heated again by adding hot oil and then the mixture has water evaporated off by reducing the pressure. This steam produced is used for the direct steam heating mentioned above. Then water vapor is evaporated off again by reducing the pressure again and this water vapor is condensed by a water cooled condenser. In this way water vapor is evaporated off with he double use of heat. (Sinha-OEIS)
W79-01398

TREATING PAINT WASTE SOLIDS,
Carrier Drysys Ltd., London (England). (Assignee).
For primary bibliographic entry see Field 5D.
W79-01416

KOHL SPRING - BIOGEOCHEMISTRY OF A BLACKWATER SYSTEM,
Missouri Univ.-Columbia.
For primary bibliographic entry see Field 5B.
W79-01421

WASTEWATER RECYCLING ON FOREST LANDS,
Pennsylvania State Univ., University Park. School of Forest Resources.
For primary bibliographic entry see Field 5D.
W79-01424

5F. Water Treatment and Quality Alteration

REMOVAL OF METALLIC IMPURITIES FROM WATER BY ELECTROCHEMICAL METHODS,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 5D.
W79-01121

INJURIOUS EFFECT OF TAP WATER ON ROOTING OF CUTTINGS OF BRYOPHYLLUM CALYCINUM,
Rockefeller Univ., New York.
For primary bibliographic entry see Field 5C.
W79-01221

MANUAL OF INDIVIDUAL WATER SUPPLY SYSTEMS.
Environmental Protection Agency, Washington, DC. Office of Water Programs.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 402, Price codes: A08 in paper copy, A01 in microfiche. Report No. EPA-430/9-74-007, 1975. 166 p, 28 fig, 8 tab, 40 ref, 4 append.

Descriptors: *Water supply, *Water consumption(except consumptive use), *Water distribution(Applied), Manuals, Groundwater, Water sources, Water wells, Surface runoff, Surface waters, Surface water availability, Rural areas, Water storage, Water quality, Pumping, Bacteria, Disinfection, Legislation.

Guidelines for planning an individual water supply system are provided in this manual which is a revision of PHS Publication No. 24, Individual Water Supply Systems, published in 1962. The contents are divided into five parts: selection of a water source; groundwater; surface water for rural use; water treatment; and pumping, distribution, and storage. Information is provided for determining the quality and quantity of water needed for various uses. The characteristics of groundwater are discussed, followed by details on constructing wells, such as types of wells, ground preparation, testing procedures and sanitary considerations. Principal sources of surface water considered include controlled catchments, ponds or lakes, surface streams and irrigation canals. Information on natural and manmade water treatment processes such as sedimentation, coagulation-flocculation, filtration, and conditioning is presented. Equipment used in pumping, distribution and storage is examined. The appendices provide: a recommended procedure for cement grouting of wells for sanitary protection, steps for determining bacteriological quality of a water supply, methods of emergency disinfection, and suggested legislation for water well construction and pump installation. (Gibson-IPA)
W79-01311

A PILOT STUDY OF DRINKING WATER SYSTEMS ON AND ALONG THE NATIONAL SYSTEM OF INTERSTATE AND DEFENSE HIGHWAYS.
Environmental Protection Agency, Washington, DC. Office of Drinking Water.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 320, Price codes: A04 in paper copy, A01 in microfiche. Report No. EPA - 430/9-73-018, December 1973. 52 p, 2 fig, 9 tab, 6 ref, 4 append.

Descriptors: *Water supply, *Potable water, *Drinking water, *Water quality, Interstate, Highways, Safety, Sampling, Surveys, Laboratory tests, Facilities, Water quality control.

Results of a study of 119 water supply systems serving the traveling public along Interstate Highways in Virginia, Oregon and Kansas are presented. The two main categories of water supply systems studied were safety rest areas owned and operated by the respective State Highway Departments and commercial service facilities such as restaurants, service stations and motels. Each water supply system was investigated on the basis of drinking water quality, adequacy of facilities and their operation, and adequacy of the surveillance program. The findings of the study indicate that 63 percent (75) of the water systems surveyed delivered water which failed to meet one or more constituent limits of the U.S. Public Health Service Drinking Water Standards, 19 percent (22) of the systems failed to meet at least one mandatory limit, and 15 percent (18) were contaminated with coliform bacteria. The evaluation criteria, procedures used in the field study, sampling program and laboratory study are detailed recommendations are presented. (Gibson-IPA)
W79-01312

A MANUAL FOR THE EVALUATION OF A STATE DRINKING WATER SUPPLY PROGRAM,
Environmental Protection Agency, Washington, DC. Office of Drinking Water.
J. E. Warren.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 445, Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA-430/9-74-009, 1974. 59 p, 13 ref, 3 append.

Descriptors: *Water supply, *Potable water, *Water supply development, *Evaluation, Management, Water management(Applied), Water quality, Water quality control, Surveys, State governments, Standards, Public health, Regulation, Project planning.

Guidelines are supplied for conducting evaluations of state drinking water supply programs and developing new programs to effectively regulate and insure a healthful and safe supply of drinking water to the public. Methods of identifying programs deficiencies are described and criteria by which corrective measures can be developed are proposed. Three major spheres or divisions of authority under which a state water supply program normally operates are discussed, and cover: legal statutes, administrative rules and regulations, and water supply program policy. Suggestions are given for appropriate state water supply program activities and resources (both manpower and monetary). Also included under guidelines for evaluation of a state's drinking water supplies are: criteria for selecting a representative number of public water supplies for study; current assessment of water supply systems based on a field survey of existing conditions and examination of data in official files; and important sanitary features of a water supply system and their health significance. (Majtenyi-IPA)
W79-01313

CHARACTERISTICS OF SMALL MAMMAL POPULATIONS IN FORESTED AND OLD FIELD HABITATS PRIOR TO EFFLUENT SPRAY IRRIGATION,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 5C.
W79-01331

FLUORIDE REMOVAL FROM POTABLE WATER SUPPLIES,
Illinois State Water Survey, Urbana.
F. W. Sallo, Jr., E. Larson, and H. F. Mueller.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 969, Price codes: A03 in paper copy, A01 in microfiche. University of Illinois Water Resources Center Research Report No. 136, September, 1978. 20 p 3 fig, 5 tab, 2 ref. A-094-ILL(1).

Descriptors: *Fluorides, *Coagulation, *Flocculation, Magnesium hydroxide, Water softening, Adsorption, Activated carbon, *Water treatment, Alum, *Fluorapatite, Coagulant aid.

The objective was to determine whether or not the fluoride level in waters with moderate fluoride content (2 to 10 mg/1) could be reduced to acceptable levels by chemical treatment. The optimum concentration for dental health is from 1.1 to 1.8 mg/1. A variety of methods for the removal of fluoride have been reported in the literature. Methods which appeared to have some possibility of success were compiled. Coagulation with alum at pH levels of 6.2 to 6.4 was one of the more effective methods tested. Fluoride was found to be adsorbed by magnesium hydroxide. This occurs in the softening process with magnesium-containing waters, and could be increased by adding both magnesium salts and lime. The formation of fluorapatite by the reaction of fluoride with phosphoric acid and lime was very effective for the removal of fluoride. Flocculation with iron salts was of little benefit in the removal of fluoride. The fluoride removed was from 2 to 10 percent of the initial concentration. Activated charcoal was tested without any appreciable success. Polyelectrolytes, in general, did not remove fluoride, but were very helpful in obtaining good clarification from some processes and thereby aided in fluoride removal.
W79-01351

SYSTEM FOR REMOVAL OF TOXIC HEAVY METALS FROM DRINKING WATER,
Ameron, Inc., South Gate, CA. (Assignee).
E. R. du Fresne.
U.S. Patent No. 4.096,064, 9 p, 2 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 971, No 3, p 1121-1122, June 20, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, Water pollution, Water pollution treatment, Water quality control, Heavy metals, Electrochemistry, Ion transport, Equipment, 'Half-length' concept.

Toxic heavy metal ions are removed from water by electrochemical replacement as the water flows through a tandem bed of (1) activated zinc and the (2) magnesium alloyed with a minor amount of manganese to inhibit corrosion. The zinc is activated by contact with a noble metal salt. Preferably, fine granules of zinc and Mg/Mn are used. Clogging is prevented by intermittent vacuum degassing of the beds. The activated zinc and the Mg/Mn advantageously are prepackaged and stored in cartridges which become part of the processing column. The Mg/Mn cartridge has a non-reactive atmosphere of e.g., argon, retained by frangible or soluble barriers that hermetically seal the ends of

the cartridge. The barriers are torn away or dissolved by the initial water flow when the cartridge is installed. System scale-up is simplified by a 'half-length' concept characteristic of the present invention. Specifically, the heavy metal ion concentration is reduced by one-half for each additional fixed distance ('half-length') traversed through the reactant bed. (Sinha-OEIS)
W79-01393

WATER STERILIZATION APPARATUS,
Sachs-Systemtechnik G.m.b.H., Schweinfurt (Germany, F.R.).
W. Fischer.
U.S. Patent No. 4,097,355, 5 p, 1 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 971, No 4, p 1552, June 27, 1978.

Descriptors: *Patents, *Water purification, *Water treatment, *Water quality control, Electrolysis, Electrodes, Conductivity, Oxidation, Water properties, Electrical properties, Equipment.

The electrodes of a water purifcation cell are immersed in the water to be sterilized. The current through the cell is kept constant by varying the resistance of an emitter-collector circuit of a transistor connected in series with the cell to compensate for changes in the cell's internal resistance. The voltage across the cell is monitored by two threshold circuits to determine if the conductivity of the water is within an allowable conductivity range. If the conductivity falls outside the range, a light-emitting diode is energized. The light-emitting diode is also energized if the voltage of the battery supplying the power for the cell falls below a given value. If no water is present in the supply line to the cell, a switching transistor is blocked, thereby disconnecting most of the equipment from one side of the battery. (Sinha-OEIS)
W79-01395

ALGAECIDAL COMPOSITION,
Applied Biochemists, Inc., Mequon, WI. (Assignee).
D. E. Seymour, J. C. Schmidt, and D. A. Bezella.
U. S. Patent No. 4,098,602, 4 p, 7 ref; Official Gazette of the United States Patent Office, Vol 972, No 1, p 231, July 4, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, *Water quality control, Algae, *Algaecides.

An algaecidal composition is comprised of the combination of an ammonium quaternary compound and a copper complex formed by reacting a copper compound with a complexing material, such as an alkanolamine, a tertiary amine, a diamine, ammonium hydroxide, or a polyethylene glycol. The algaecidal composition has extended stability and shelf-life and possesses improved algaecidal effectiveness. (Sinha-OEIS)
W79-01401

METHOD OF PURIFYING WATER,
Sachs-Systemtechnik G.m.b.H., Schweinfurt (West Germany).
V. Eibl, and A. Ries.
U.S. Patent No. 4,098,660, 4 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 972, no 1, p 246, July 4, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, *Water pollution treatment, Microorganisms, Oxidation, Anodes, Flow rate, Equipment.

The invention relates to improvements in a method of purifying water contaminated with microorganisms and having a specific resistance. The method is performed in an electrolytic cell including a silver-containing anode, and the water to be purified flows substantially parallel to the anode surface. The anode may be made of a material containing metallic silver or of substantially pure (99%) silver. It has been found that it is necessary to confine the stream of water in a flow section of 1 to 4 mm from the anode in order to subject all the water simultaneously to anodic oxidation and to enrichment with silver ions. Anodic oxidation of microorganisms requires the generating of active oxygen at the anode to oxidize organic matter in the adjacent water. When anodic oxidation is combined with silver ion enrichment, the dwell time of the water in the electrolytic cell can be reduced to commercially useful periods and still achieve complete sterilization. (Sinha-OEIS)
W79-01402

PURIFICATION OF WATER FOR BOILER,
Department of Energy, Mines and Resources, Ottawa (Ontario).
J. Filby.
U. S. Patent No. 4, 098,691, 5 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 972, no 1, p 255, July 4, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, *Industrial water, Water softening, Organic matter, Ozone, Degradation(Decomposition), Oxidation, Boiler feed water, Resins, *Regeneration.

Ozone is dispersed in river water to be purified and used in a high pressure boiler. Raw water containing silicious contaminants and high molecular weight water-soluble organic molecules is contacted with ozone, before the water is contacted with the strongly-basic anion attracting resin. The ozone is dispersed in the water in sufficient quantity as to degrade larger organic molecules, with the result that the resin may satisfactorly be regenerated in conventional manner by contacting it with sodium hydroxide. Preferably the ozone is provided in an amount less than 2 parts per million by weight/per part per million by weight carbon present in the water as total organic carbon. The invention is characterized by several advantages: the ozone is selective in degrading the large organic molecules are significantly less intense in their resin-fouling properties, thereby making it possible to use the resins longer before regeneration is needed; and because ozone is a powerful oxidizing agent, the need for chlorine pretreatment is reduced or eliminated. (Sinha-OEIS)
W79-01405

PURIFICATION OF WATER BY REVERSE OSMOSIS USING A SUPPORTED SEMI-PERMEABLE MEMBRANE,
United Kingdom Atomic Energy Authority, London (England), (Assignee).
G. M. Gale.
U.S. Patent No. 4,100,064, 5 p, 8 ref; Official Gazette of the United States Patent Office, Vol 972, no 2, p 715, July 11, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, *Reverse osmosis, Membrane processes, *Semi-permeable membranes, Polyvinyl chloride(pvc).

This invention relates to porous plastic materials, and in particular to porous rigid polyvinyl chloride (pvc). A method of making porous rigid pvc comprises extruding or moulding a stabilized rigid pvc mix containing from 0.5% to 3.0%, by weight on the weight of the pvc, of a chemical blowing agent. Tubes for use in water purification by reverse osmosis preferbly have a least 1 hole/ sq mm, e. g. from 1 to 10 holes/sq mm of outside surface area. The tubes are intended to have the semi-permeable membrane applied to the smooth outer surface and to have impure water in contact with this treated outer surface that purified water is recovered from the bores of the tubes.
W79-01414

5G. Water Quality Control

NITROGEN AND IRRIGATION MANAGEMENT TO REDUCE RETURN-FLOW POLLUTION IN THE COLUMBIA BASIN,
Washington State Univ., Pullman. Dept. of Agronomy and Soils.
B. L. McNeal, and B. L. Carlile.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 328, Price codes: A08 in paper copy, A01 in microfiche. Environmental Protection Agency Report No. 600/2-76-158, September, 1976.

Descriptors: *Nitrogen, Leaching, Crop production, Potatoes, Washington, *Colorado river, Nutrients, Fertilizers, Fertilization, Nitrification, Sprinkler irrigation, Irrigation, *Irrigation systems, Furrow irrigation, Sampling, *Return flow.

Cooperative field studies have evaluated dissolved-N levels and leaching, and corresponding crop yields, for potato production practices in the Columbia Basin area of Washington. High dissolved-N levels (with resultant high potential for return-flow pollution) were found throughout the growing season in well-managed potato fields, with levels decreased by decreasing fertilization rate, use of slow-release N fertilizers oritrification inhibitors, or sprinkler application of N fertilizers. Careful water management with solid-set sprinklers proved capable of maintaining dissolved-N within the root zone of subsequent crops by season's end, even on very sandy sites. Alternate-furrow irrigation proved effective in 'trapping' banded fertilizer N within the plant root zone on heavier-textured furrow-irrigated soils. Periodic 'mining' of residual N by other crops in the rotation would still be necessary to prevent eventual return-flow contamination, however. (See also W78-07611) (Skogerboe-Colorado State)
W79-01001

REGIONAL WATER SUPPLY CAPACITY EXPANSION WITH SEASONAL DEMANDS AND ENERGY COSTS,
California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 6A.
W79-01002

MODELING PESTICIDES AND NUTRIENTS ON AGRICULTURAL LANDS,
Hydrocomp, Inc., Palo Alto, CA.
For primary bibliographic entry see Field 5B.
W79-01004

MINE EFFLUENTS IN THE FRONT RANGE MINERAL BELT OF COLORADO,
Colorado School of Mines Golden.
For primary bibliographic entry see Field 5B.
W79-01008

THE ORDINARY HIGH WATER MARK: ATTEMPTS AT SETTLING AN UNSETTLED BOUNDARY LINE,
Spessard L. Holland Law Center, Gainesville, FL.
For primary bibliographic entry see Field 6E.
W79-01009

IMPACT OF MINE DRAINAGE ON A MOUNTAIN STREAM IN PENNSYLVANIA,
Illinois Inst. of Tech., Chicago. Pritzker Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5C.
W79-01017

ABUNDANCE, DIVERSITY, AND STABILITY IN SHORE-ZONE FISH COMMUNITIES IN AN AREA OF LONG ISLAND SOUND AFFECTED BY THE THERMAL DISCHARGE OF A NUCLEAR POWER STATION,
Battelle Columbus Lab., Duxbury, MA.
For primary bibliographic entry see Field 5C.
W79-01021

BIOLOGICAL CONTROL AGENTS OF SEWAGE BACTERIA IN MARINE HABITATS,
New South Wales Univ., Kensignton, Australia. School of Microbiology.
For primary bibliographic entry see Field 5C.
W79-01027

PARAMETERIZATION OF SULFATE REMOVAL BY PRECIPITATION,
Battelle Pacific Northwest Labs., Richland, WA.
For primary bibliographic entry see Field 5B.
W79-01038

TRANSMISSIVITY AND HYDRAULIC CONDUCTIVITY OF SATURATED SEDIMENTARY ROCKS IN THE HANFORD RESERVATION,
Atlantic Richfield Hanford Co., Richland, WA.
For primary bibliographic entry see Field 8B.
W79-01053

EFFLUENT TREATMENT PLANT CLEANS UP DOWN THE VALLEYS,
For primary bibliographic entry see Field 5D.
W79-01078

THE EFFECTS OF LAND USE ON PHOSPHORUS LOADING: A CASE STUDY - SIX MILE RUN RESERVOIR,
Rutgers University Dept. of Environmental Science New Brunswick, New Jersey.
For primary bibliographic entry see Field 5C.
W79-01086

PRE-MANAGEMENT ASSESSMENT OF AQUATIC MACROINVERTEBRATES IN A SMALL, SEDIMENTARY DRAINAGE AREA OF THE MAUMEE AND LAKE ERIE BASIN.
Purdue Univ., Lafayette, IN. Dept. of Entomology.
For primary bibliographic entry see Field 5C.
W79-01096

REGIONAL GROUND-WATER MANAGEMENT,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W79-01105

FIELD PERMEABILITY METHODS FOR IN-PLACE LEACHING,
Bureau of Mines, Twin Cities, MN. Twin Cities Mining Research Center.
For primary bibliographic entry see Field 2F.
W79-01111

URBAN RUNOFF POLLUTION AND WATER QUALITY PLANNING,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 5B.
W79-01134

DRAINAGE CONTROL TO DIMINISH NITRATE LOSS FROM AGRICULTURAL FIELDS,
North Carolina State Univ. at Raleigh. Dept. of Soil Science.
J. W. Gilliam, R. W. Skaggs, and S. B. Weed.
Paper No. 77-2030 presented at American Society of Agricultural Engineers 1977 Annual Meeting, June 26-29, 1977. North Carolina State University. 16 p, 8 fig, 11 ref. OWRT A-083-NC(1), 14-34-0001-7070.

Descriptors: *Drainage control, *Nitrate, Nitrogen, Agricultural soils, *Water movement, Surface waters, Denitrification, Water level control, Coastal plain soils, *North Carolina.

Flashboard riser type water level control structures were installed in four tile mains or outlet ditches at two locations. Under controlled drainage conditions, there was a large decrease in both nitrate and drainage water lost through the artificial drainage systems. The effect on nitrate ultimately entering surface waters, however, is believed to depend on soil type.
W79-01137

THE FOX IN THE CHICKEN COOP: THE REGULATORY PROGRAM OF THE U.S. ARMY CORPS OF ENGINEERS,
Maryland Univ., Baltimore. School of Law.
For primary bibliographic entry see Field 6E.
W79-01141

INDIANS AND THE ENVIRONMENT: AN EXAMINATION OF JURISDICTIONAL ISSUES RELATIVE TO ENVIRONMENTAL MANAGEMENT,
George Washington Univ., Washington, DC. National Law Center.
For primary bibliographic entry see Field 6E.
W79-01143

IN PURSUIT OF CLEAN OCEANS - A REVIEW OF THE MARINE PROTECTION, RESEARCH, AND SANCTUARIES ACT,
Naval Facility Engineering Command, San Bruno, CA. Western Div.
R. L. Kuersteiner, and E. G. Herbach.
Santa Clara Law Review, Vol 18, No 1, p 157-80, 1978, 1 tab.

Descriptors: *Oceans, *Permits, *Water pollution sources, *Water pollution control, Disposal, Wastes, Water quality, Ultimate disposal, Water pollution, Legal aspects, Federal government, Legislation, International waters.

The Marine Protection, Research, and Sanctuaries Act, or Ocean Dumping Act (Act), was enacted by Congress in 1972 to regulate ocean dumping of refuse. The United States has also pursued international agreements to control waste dumping. Under the Act, permits are required to transport any material for dumping, whether the vehicle emanates from the United States or whether it is brought here by a federal agency or official. Permits for dumping dredged spoils are issued by the Secretary of the Army while other permits go through the Administrator of the federal Environmental Protection Agency. Civil and criminal sanctions are provided for violations, and a permit revocation procedure is established, as is a private right of action to enjoin a violator. The Act was amended in 1974 to prohibit disposal of chemical and biological warfare agents and high level radioactive wastes. Additionally, federal law was extended to regulate transportation of foreign-source material by United States flag vessels for ocean dumping. The Act must be examined with the Federal Water Pollution Control Act and the National Environmental Policy Act in order to determine its effectiveness. (Rule-Florida)
W79-01144

POLICY IMPLICATIONS OF URBAN LAND PRACTICES FOR GROUNDWATER QUALITY,
American Inst. of Planners, Washington, DC.
H. F. Wise.
Water and Sewage Works, Vol 124, No 10, p 84-85, October, 1977.

Descriptors: *Long-term planning, *Water management(Applied), *Urbanization, *Water quality control, Federal Water Pollution Control Act, Alternative planning, Comprehensive planning, Budgeting, Water allocation(Policy), Water pollution control, Future planning(Projected).

Several influences have brought about changes in urban land use practices. Realization of the costs of urban sprawl, management and control of urban growth, passage by Congress of environmental and resource legislation, the expansion of areawide councils of local government, and increasing state concern with costs of urban services have all contributed to the trend toward planning for gradual development rather than 'end-state' planning. Additionally, under the 1974 federal Housing and Community Development Act, those who receive comprehensive planning assistance funds must prepare a land-use element and a housing element in their comprehensive planning exercise. Quality management planning is influenced by Section 208 of the Federal Water Pollution Control Act (FWPCA), which requires that a region stage its growth. There must be an annually updated five year capital budget for sewage collector systems and treatment works. This would cause a staggering of development and phasing of induced social and economic effects. The implications of the nonpoint source management planning requirement of the 1972 FWPCA Amendments are just beginning to be understood, but will probably have the most direct influence on maintaining groundwater quality. (Rule-Florida)
W79-01146

FEDERAL COMMON LAW AND OCEAN POLLUTION: A PRIVATE REMEDY FOR OIL POLLUTION DAMAGE,
J. M. Glaeser.
Environmental Law, Vol 8, No 1, p 1-46, Fall 1977.

Descriptors: *Oil spills, *Remedies, *Federal jurisdiction, *Judicial decisions, Oceans, Common law, Oil pollution, Damages, Compensation, Oil industry, Cost allocation, Water quality standards.

There is a considerable lack of remedies available to private parties who suffer direct damages as a result of an increasing number of ocean oil spills. The federal common law offers great potential to fill the gaps found in current legal regimes. The first section of this article explores the inadequacy of present legal systems in providing compensation to private parties for damages resulting from oil spills. Available remedies, or lack thereof, within the international, national and state legal systems are discussed. The next section analyzes the development of federal common law, beginning with the landmark case of Erie Rail Road Company v. Tompkins. There is a detailed analysis of the recent case of Illinois v. City of Milwaukee and other cases following its holding. The case determined that where there was no specific remedy prescribed by Congress, federal courts may fashion one from applicable federal law. The Court implied further that courts may fashion federal law where federal rights are concerned, even where a remedy is available. The author concludes that, in the absence of adequate conventional remedies, federal common law should provide an interim remedy for private parties. (Quarles-Florida)
W79-01150

PROBLEMS IN ATTEMPTING TO TRANSLATE STATUTORY STANDARDS INTO EMISSION LIMITATIONS UNDER AIR AND WATER POLLUTION CONTROL LEGISLATION,
Yeshiva Univ., New York. School of Law.
J. L. F. Silver.
Villanova Law Review, Vol 22, No 6, p 1122-70, 1976-77.

Descriptors: *Water quality standards, *Water pollution control, *Federal Water Pollution Control Act, Water Quality Act, Water quality control, Abatement, Evaluation, Administration, Regulation, Legislation.

The health- or technology-based regulatory schemes in water pollution control legislation have raised implementation problems. Enacted in response to shortcomings of the 1965 federal Water Quality Act, the Federal Water Pollution Control Act (FWPCA) provided direct, centralized federal control over effluent limitations, and establishment of effluent limitations based on practical considerations. Questions concerning the scope of the federal Environmental Protection Agency (EPA) authority to control effluent quality have been resolved, but administrative difficulties arising from the technology base of the statute remain. A health-based statute would force courts to consider whether to uphold EPA action that would terminate enterprises, while the technology-based statute disguises the decision as a question of whether a given technology or effluent standard is economically feasible. Cases decided under the FWPCA imply that the country may not be ready to make sacrifices necessary to achieve an acceptable environment. If so, the health or technology basis of the statute may not be important. Im-

proved Congressional drafting could help EPA achieve an effective pollution control system by reducing litigation, tying federal programs to compliance with related pollution control measures, and granting EPA a larger administrative staff. (Rule-Florida)
W79-01151

COASTAL PLANNING: THE DESIGNATION AND MANAGEMENT OF AREAS OF CRITICAL ENVIRONMENTAL CONCERN,
North Carolina Univ. at Chapel Hill. School of Law.
T. J. Schoenbaum, and K. G. Silliman.
Urban Law Annual, Vol 13, p 15-48, 1977.

Descriptors: *Coasts, *State jurisdiction, *Federal government, *Management, Constitutional law, Legal aspects, Legislation, North Carolina, Future planning(Projected), Planning, Regulation, Land development.

The development control technique of identifying areas of critical environmental concern is predicated on the ideas that some geographical areas possess unique characteristics which make special management treatment appropriate, and that the state should bear responsibility for these areas. But because the designation and management processes involved have been retarded by unresolved legal and technical problems, regulation of these areas has not been widely used as a planning technique. The technique will be increasingly important because the 1972 federal Coastal Zone Management Act requires that in order to qualify for federal coastal zone management grants, each state must include in its management program an inventory of areas of special concern within the coastal zone. Legislation in several states is evaluated in this article, with attention focused on the North Carolina statute. Additionally, there is a discussion of the limitations of administrative law and the constitutional restrictions of due process and equal protection as they apply to the administrative processes. The problem of characterizing the administrative designation of an area as on of critical concern as a taking of property without just compensation is also discussed. (Rule-Florida)
W79-01152

UNDERGROUND INJECTION PROGRAM SET UNDER SAFE DRINKING WATER ACT,
New Mexico State Univ., University Park. School of Engineering.
J. W. Hernandez.
Water and Sewage Works, Vol 124, No 10, p 67-69, October, 1977.

Descriptors: *Potable water, *Subsurface waters, *Underground waste disposal, *Injection, Water quality standards, Federal government, Administrative agencies, Waste disposal, Groundwater, Water management(Applied), Water conservation, Water permits.

Prior to the 1974 passage of the National Safe Drinking Water Act, the federal Environmental Protection Agency (EPA) was authorized to prescribe federal drinking water standards for water supplies used by interstate carriers. However, EPA may now establish standards for harmful contaminants in all public drinking water systems. Major provisions of the Act include the establishment of primary and secondary contaminant regulations, establishment of regulations to control subsurface injection, initiation of health, economic, and technological research, initiation of rural water surveys, and fund allocations to states to improve water supply programs. EPA requires National Pollutant Discharge Elimination System permits when a surface discharge permit is already in effect, and when a surface discharge has been replaced by a sub-surface disposal system. EPA policy is in opposition to the emplacement of pollutants by subsurface injection without strict control and a determination that waste injection will not interfere with use of groundwater resources. Under the Act, states will have enforcement responsibility for groundwater protection. State underground injection control programs must be EPA-approved, and provisions for the protection of sole-source aquifers will remain under EPA control. (Rule-Florida)
W79-01154

NATIONAL WATER COMMISSION VIEWS GROUNDWATER PROTECTION,
H. O. Banks.
Water and Sewage Works, Vol 124, No 10, p 73-75, October, 1977.

Descriptors: *Water quality control, *Water management(Applied), *National water commission, *Aquifer management, Groundwater resources, Subsurface waters, Aquifers, Water resources development, Administrative agencies, Water pollution control, Artificial recharge.

Management of groundwater resources and protection of groundwater quality has received considerable attention from the National Water Commission. Studies conducted by the Commission on state water and groundwater laws, management, and administration indicate that state groundwater law is often inadequate to allocate the resource, and is not responsive to the problem of excessive use. The Commission does not feel that Federal regulation is desirable, but that a new legal system should be instituted in some states to govern groundwater. Laws authorizing the establishment of agencies to manage both surface and groundwater should be enacted to coordinate withdrawals, control the rate of aquifer depletion, replenish aquifers through artificial recharge techniques, and protect them from pollution. Groundwater pollution may be more significant than pollution of surface water, but often the same quality control expertise must be applied to both. Agencies responsible for surface water pollution controls should also be responsible for groundwater abatement. Additionally, interstate aquifers should be managed and regulated in the same manner as intrastate aquifers. Finally, more technical data and other information is needed to make sound decisions regarding groundwater regulation and management. (Rule-Florida)
W79-01155

STATE APPROACH TO GROUNDWATER QUALITY PROTECTION: THE ILLINOIS EXPERIENCE,
Illinois Environmental Protection Agency, Springfield. Div. of Land Pollution Control.
J. S. Moore.
Water and Sewage Works, Vol 124, No 11, p 99-100, November, 1977.

Descriptors: *Groundwater resources, *Water management(Applied), *Waste disposal, *Illinois, Administrative agencies, Landfills, Administration, Water quality control, Permits, Subsurface waters, Aquifer management, Injection.

The Division of Land Pollution Control of the Illinois Environmental Protection Agency is responsible for the safe, economical and environmental disposal of domestic, liquid, and hazardous wastes. This agency has permit authority in these areas and for underground injection wells, while the Illinois Department of Public Health and the state Department of Mines and Minerals share responsibility for groundwater protection. The State Geological Survey and State Water Survey for groundwater protection. The State Geological Survey and State Water Survey engage in research and resource interest. After the 1970 passage of the Illinois Environmental Protection Act, the state was able to develop solid-waste rules and regulations, and now has sanitary landfills instead of open-burning garbage dumps. Both liquid and special waste may be incorporated into solid-waste landfills in some areas, upon issuance of a special supplementary permit. Direct sanitary landfilling, subsurface injection, surface absorption, consignment burial and land spreading are used. Existing programs will be tied into the development of a state groundwater policy to address the legal responsibilities of various state agencies, define major aquifers and protective guidelines, and to develop statewide water level measurement and groundwater measuring networks. (Rule-Florida)
W79-01156

THERMAL DISCHARGES AND POWER PLANT INTAKES: SECTION 316 IN PERSPECTIVE,
G. S. P. Bergen.
Natural Resources Lawyer, Vol 11, No 2, p 305-23, 1978.

Descriptors: *Federal Water Pollution Control Act, *Thermal water, *Thermal powerplants, *Water quality standards, Permits, Cost-benefit analysis, Effluents, Cooling, Intake structures, Costs, Powerplants, Pollution abatement.

Section 316 of the Federal Water Pollution Control Act allows conditions in pollutant discharge permits for steam-electric power plants to be adjusted to meet the environmental and economic realities at individual sites. Section 316 serves the following functions: (1) it allows restrictions on discharges of heat to be relaxed; (2) it allows special permit conditions to be imposed to regulate intake structure location, design, construction and capacity on a cost-benefit basis; and (3) it immunizes a thermal discharge--modified to meet thermal effluent limitations--from the need to comply with any subsequent, more stringent, requirements for a period not to exceed 10 years. Application of the section has generated much controversy, because of its awkward structure and vagueness. The cost of retrofitting existing once-through cooling systems with closed-cycle cooling is enormous. Uncertainty exists as to the character and the significance of the environmental impacts actually caused by power plant discharges and intakes. The article begins with an orientation of Section 316 within the Act's framework. It then focuses individually on the three functions of the Section. The author concludes that, viewed with common sense, the elements of Section 316 can be rationally interpreted. (Quarles-Florida)
W79-01159

GUIDELINES FOR MANDATORY EROSION CONTROL PROGRAMS,
Wisconsin Univ.-Madison.
S. M. Harder, T. C. Daniel, and F. W. Madison.
Journal of Soil and Water Conservation, Vol 33, No 2, p 80-84, March-April, 1978.

Descriptors: *Erosion control, *Sedimentation control, *Federal water pollution control act, *Regulation, State governments, Local governments, Water pollution, Waste treatment, Legislation, Soil conservation, Sedimentation, Water quality.

State governments are in the best position to enact legislation providing minimum, uniform guidelines for mandatory erosion control programs. Local governments may then tailor these guidelines to meet their individual needs. This is the conclusion of this article reviewing programs implemented by local governments in attempting compliance with Section 208 of the 1972 Federal Water Pollution Control Act Amendments. The law requires each state to develop areawide waste treatment management plans addressing both point and nonpoint pollution. The current emphasis is on nonpoint sources, with the most common problem being soil erosion and subsequent sedimentation. The problems with the use of local authority alone for reducing erosion are threefold. They are: (1) lack of county jurisdiction in incorporated areas; (2) restrictions placed on county authority to enact and enforce ordinances; and (3) lack of uniformity for water quality and economic effects. The report analyzes programs in Iowa, Michigan, Pennsylvania and Ohio. The article includes a consolidation of the best components of each program. Although the model program is not presented in detail, it should provide a basis for the development of a comprehensive, flexible erosion control program. (Quarles-Florida)
W79-01160

UP TO OUR WASTES IN WET SUITS: THE FEDERAL LAW ON WATER POLLUTION,
E. L. Lasseter, Jr.
Cumberland Law Review, Vol 8, No 3, p 731-61, Winter 1978.

Descriptors: *Federal Water Pollution Control Act, *Rivers and Harbors Act, *Federal government, *Remedies, Legislation, Toxins, Civil law, Commercial fishing, Navigable waters, Interstate rivers, Water pollution, Damages.

Under the 1972 federal Water Pollution Control Act the federal Environmental Protection Agency (EPA) has the authority to improve and maintain the quality of the nation's waters. While there is no express provision in the Act for private actions, violators can be assessed cleanup costs. A list of standards dealing with toxic pollutants is now in effect. The tools for enforcement exist under the Act, yet the question remains as to whether they will be used. Private persons who suffer specific damages as a result of water pollution are entitled to compensation. In addition, private damage actions may also be allowed. These two remedies are based on Section 13 of the federal Rivers and Harbors Act. This section, known as the Refuse Act, is the only one which deals with water pollution. Enforcement rests with the secretary of the Army. Because the quality of interstate and navigable waterways is primarily a federal concern, federal law in this area must be developed and applied. Water pollution causes specific injuries to others than commercial fisherman and riparian landowners, and the law must take notice of these others who are damaged. (Spiegel-Florida)
W79-01161

A COMPARISON OF BETHLEHEM STEEL CORP V. TRAIN WITH REPUBLIC STEEL CORP. V. TRAIN: THE SIXTH CIRCUIT,
A. W. Staver.
Environmental Law, Vol 8, No 1, p 173-201, Fal, 1977.

Descriptors: *Federal Water Pollution Control Act, *Judicial decisions, *Water pollution control, *Analysis, Water quality, Water pollution, Pollutants, Legislation, Effluents, Water quality control, Water quality standards, Industrial wastes.

The 1972 Federal Water Pollution Control Act Amendments contain an unequivocal 1977 deadline for the achievement of effluent limitations for point sources using the best practicable control technology available. However, the mutability of that deadline has been the central issue in two important judicial decisions construing the Act. Bethlehem Steel Corporation challenged the deadline in one case, but the Third (Federal) Circuit refused to grant an extension. Republic Steel Corporation met with more success in the Sixth (Federal) Circuit, which held that the deadline was unenforceable due to the federal Environmental Protection Agency's failure to promulgate the effluent limitations for the steel industry. This article analyzes this conflict between the two Circuit Court decisions. In order to understand the issues, a discussion of the relevant sections of the Act is included. The author concludes that the Sixth Circuit's Republic decision was decided incorrectly in light of the express language of the statute and its legislative history. This is borne out by the case's inconsistency with Supreme Court decisions, other environmental studies and the equitable considerations involved. (Quarles-Florida)
W79-01162

SOIL EROSION CONTROL POLICIES - INSTITUTIONAL ALTERNATIVES AND COSTS,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Economics.
W. D. Seitz, and R. G. Spitze.
Journal of Soil and Water Conservation, Vol 33, No 3, p 118-125, May-June, 1978, 4 fig, 3 tab.

Descriptors: *Erosion control, *Sediment control, *Planning, *Water pollution treatment, Erosion, Soil erosion, Sedimentation, Agriculture, Pollutants, Water quality, Planning, Cost analysis.

Plans to control non-point sources of water pollution are being developed in accordance with the law. These plans must include policies and procedures for reducing the level of pollutants generated by agriculture, primarily via soil erosion. This article presents a system for policy development that can be used in this area, as well as other problem areas. Component steps in alternative policies are identified, and ways to achieve each step are explained. A broad range of planning possibilities are available to planners. Administrative costs of several policies are estimated with a cost-synthesis approach. The analysis begins by tracing the history of conservation institutions that arose as public policy responses to soil erosion problems. The present status of soil conservation districts across the country is explored. The scheme for policy development presented has five principal components: (1) control instruments; (2) performance indicators; (3) control techniques; (4) compliance measures; and (5) temporary penalties. Specific examples of the use of the scheme in designing alternative erosion and sediment control policies are presented. Necessary changes in existing institutional arrangements are also explored. (Quarles-Florida)
W79-01164

PRINCIPLES FOR WATER QUALITY MANAGEMENT,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Engineering.
D. A. Okum.
Journal of the Environmental Engineering Division (ASCE), Vol 103, No EE6, p 1039-55, December, 1977.

Descriptors: *Water management(Applied), *Regional development, *Water quality control, *Water policy, Water pollution, Water pollution control, Water supply, Potable water, Water quality, Environmental engineering, Engineering, Technology.

Environmental engineers must become involved in the establishment of goals for water quality and methods for attaining these goals. This article proposes five principles to initiate consideration among environmental engineers of a philosophy for water quality management. These five axioms of sound water management are: (1) every water project is unique; (2) the efficiencies and economies of scale inherent in water projects should be exploited; (3) in general, those who benefit from water projects should bear the costs; (4) potable water should be drawn from protected rather than polluted sources; and (5) the management of water supply and water pollution control should be integrated. The proponent of these principles is an engineer who is disturbed by the increasing importance of regulation rather than quality engineering. He discusses the recent revolution in water management in England. The five enumerated principles are drawn from the experience there. These principles are discussed at some length. The author also urges a regional approach to water management. The reluctance of communities to yield sovereignty over their water supplies is cited as the major obstacle to regionalization. (Quarles-Florida)
W79-01165

TAP WATER AND TIMBER - THE COSTS OF MULTIPLE USE,
L. Popovich.
Journal of Forestry, Vol 75, No 11, p 726-30, November, 1977.

Descriptors: *Forest watersheds, *Oregon, *National parks, *Water quality control, Forestry, Water, Forest management, Watershed management, Legislation, Water supply, Land management, Recreation.

The U.S. House of Representatives' Interior Committee has reported out a bill to provide for water quality and forest management on the Bull Run (Oregon) watershed located on Mt. Hood National Forest. The Forest Service manages the land today, since it is in a national forest. The Service authorized timber sales on the watershed in 1958. However, in 1973, a class action suit was brought under the Trespass Act, a statute prohibiting any use of the watershed that threatens water quality. The court found that timber harvesting did not protect water quality and closed the area to logging and recreation. Existing logging contracts were permitted to be honored. To insure water quality, Portland city fathers are angling for equal management authority and a federally funded water treatment plant. The Forest Service does not wish to share authority in exchange for harvesting rights, but this appears to be the direction of the end result. The pending bill would repeal the Trespass Act and permit harvesting, but water quality would still be of primary concern. (Quarles-Florida)
W79-01166

WATER RESOURCES AND OTHER RELATED LAWS OF ILLINOIS.
Illinois State Dept. of Transportation, Springfield.
For primary bibliographic entry see Field 6E.
W79-01168

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1977 (PART 6, NEW ORLEANS, LA.).
For primary bibliographic entry see Field 6E.
W79-01169

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1977 (PART 7, BURLINGTON, VT.).
For primary bibliographic entry see Field 6E.
W79-01170

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1977 (PART 9, WASHINGTON, D.C.).
For primary bibliographic entry see Field 6E.
W79-01171

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1977 (APPENDIX, STATEMENTS SUBMITTED FOR THE RECORD).
For primary bibliographic entry see Field 6E.
W79-01172

OIL POLLUTION LIABILITY.
For primary bibliographic entry see Field 6E.
W79-01173

WATER CONTAMINATION BY TOXIC POLLUTANTS: AN ASSESSMENT OF REGULATION,
Library of Congress, Washington, DC. Div. of Environment and Natural Resources Policy.
For primary bibliographic entry see Field 6E.
W79-01174

BOND STREET AND WEATHERBEST SLIP BOATHOUSE OWNERS V. CITY OF NORTH TONAWANDA (CITY MAY NOT TERMINATE WATER SERVICE TO A CUSTOMER IN GOOD STANDING).
For primary bibliographic entry see Field 6E.
W79-01187

METALLIC MINING RECLAMATION ACT,
For primary bibliographic entry see Field 6E.
W79-01188

PHILADELPHIA CHEWING GUM CO. V. COMMONWEALTH OF PENNSYLVANIA, DEPT. OF ENVIRONMENTAL RESOURCES (LAND-OWNERS AND OCCUPIERS LIABLE FOR CORRECTION OF POLLUTING CONDITION).
For primary bibliographic entry see Field 6E.
W79-01191

WARRIOR, INC. V. EASTERLY (DEVELOPER ASSESSED DAMAGES CAUSED BY EXCESS DRAINAGE WATER AND DEBRIS POLLUTING LANDOWNER'S POND,
For primary bibliographic entry see Field 6E.
W79-01192

ANALYSIS OF ECONOMIC EFFECT OF ENVIRONMENTAL REGULATIONS ON INTEGRATED IRON AND STEEL INDUSTRY. VOLUME II,
Temple, Barker and Sloane Inc., Wellesley Hills, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 214, Price codes: A10 in paper copy, A01 in microfiche. Publication No. EPA 230/3-77-015B, July 1977. 222 p. 38 fig, 2 append. 68-01-2832.

Descriptors: *Iron and steel industry, *Regulation, *Costs, *Economic impact, *Pollution abatement, *Analytical techniques, *Water pollution control, Iron, Steel, Computer models, Air pollution, Model studies, Capital costs, Industrial wastes, Financing, Industrial production, Operation and maintenance, Effluents, Effluent limitations, Emission standards, Operating costs, Economics, Planning.

This volume, second of two-parts, describes the research methodology of a study of the economic impact of environmental regulations on the iron and steel industry. Analysis results are contained in Volume I. A computer model of the steel industry, PTm(Steel), one of a series of policy testing models, incorporates structural relationships among processes, flows, capital, and regulatory requirements, but is independent of assumptions about exogenous conditions, such as demand or interest rate, and behavior, such as capital structure. PTm(Steel) has three major components: (1) determination of production flows by process, and resulting capital needs, and computation of operation and maintenance costs; (2) costs of pollution control, separated into water and air modules; and (3) finance, in which these costs and capital needs are combined to display results of operations in terms of capital expenditure, external financing, operations and maintenance expenses, required revenues, and average price effects. policy analysis is performed with the model by incremental analysis. Data represent 93% of domestic steel shipment. Costs and impact cover from receipt of raw materials at the blast furnace or coke oven site through finishing mills. Costs of raw materials production and transport, and fabrication of steel products, are excludeddued. (Lynch-Wisconsin)
W79-01194

AQUATIC WEED MANAGEMENT: SOME PROSPECTS FOR THE SUDAN AND THE NILE BASIN, REPORT OF A WORKSHOP HELD AT KHARTOUM, SUDAN ON 24-29 NOVEMBER 1975.
Agricultural Research Council, Khartoum (Sudan).
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 990, Price codes: A04 in paper copy, A01 in microfiche. 1975. 57 p, 1 fig, 2 tab, 20 ref, 3 append. BOA AID/csd-2584.

Descriptors: *Aquatic weed control, *Water hyacinth, *Sudan, *Nile River Basin, *Beneficial use, *Biocontrol, *Chemcontrol, *Bilharzia, *Public health, Eichhornia crassipes, Rivers, Swamps, Lakes, Irrigation canals, River basins, White amur, Ctenopharyngodon idella, Water buffalo, Biogas, Methane, Utricularia, Feeds, Energy, Neochetina eichhorniae, Silage, Submerged plants.

A workshop on aquatic weed management in the Sudan and Nile River Basin (24-29 November 1975) surveyed biological and chemical control measures for water hyacinth (Eichhornia crassipes) and submerged irrigation canal weeds, and their possible beneficial uses. Recommendations called for: (1) regional cooperation between countries of the Nile Basin; (2) a ban on importing foreign aquatic plants and restrictions on the spread of plants; (3) continuation of 2,4-D spraying; (4) introduction of the water hyacinth weevil (Neochetina eichhorniae) for biocontrol testing; (5) construction of small biogas generators for methane production from weeds; (6) experiments on ensiling pressed hyacinth for animal feeds; (7) testing of composts and mulches from aquatic weeds; (8) trials with white amur fish (Ctenopharyngodon idella) prior to release into chanels; (9) introduction of water buffalo from Egypt into other parts of the region for weed control, food, and power; (10) testing of geese, such as white Chinese geese, for weed control; (11) research on bladderwort (Utricularia) for Bilharzia control; (12) tests on use of hyacinth as human food; (13) study of the use of spikerushes (Eleocharis) to create 'underwater lawns' for displacement of taller weeds in canals; (14) use of hyacinth for sewage treatment in Egypt, but not in the Sudan because of the danger of infecting areas of the Nile and Blue Nile now free fo the weed. (Lynch-Wisconsin)
W79-01205

EVALUATION OF THE IMPACT OF THE MINES DEVELOPMENT, INCORPORATED MILL ON WATER QUALITY CONDITIONS IN THE CHEYENNE RIVER.
Environmental Protection Agency, Denver, CO. Region VIII.
For primary bibliographic entry see Field 5B.
W79-01209

HOW TO OBTAIN FEDERAL GRANTS TO BUILD MUNICIPAL WASTEWATER TREATMENT WORKS.
Environmental Protection Agency, Washington, DC. Municipal Construction Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 655, Price codes: A03 in paper copy, A01 in microfiche. Report No. MCD-04, May 1976. 41 p, 1 fig, 1 append.

Descriptors: *Waste water treatment, *Municipal wastes, *Grants, Federal Water Pollution Control Act, Projects, Contracts, Financing, Water pollution treatment, Treatment facilities, Legislation, Construction, Construction costs, Sewage, Sewage treatment, Project planning, Alternative planning, Cost effectiveness.

The requirements for obtaining Federal grants for construction of municipal wastewater treatment facilities are summarized and the responsibilities borne by each participant are described. The information provided includes a discussion of pre-application considerations, such as eligibility, types of projects, the priority list, and the State water quality management plan. The application process includes preparing a plan of study and choosing a professional engineer. A number of suggestions for designing the facility are discussed, including alternatives, effluent limitations, infiltration/inflow analysis, and sewer system evaluation surveys. Some information concerning plans, specifications, and estimates is provided and related legislation is noted. A brief list of technical provisions essential for a project is supplied and steps to be followed in arranging construction are discussed including: receipt and review of bids, changes in the amount of the grant, awarding of construction contracts, and on-site inspection by the granting agency. Other program elements covered are allowable and unallowable costs, cost effectiveness, and force account. References to Federal legislation and other publications which can be of assistance to applicants is supplied and addresses are given for regional offices of the Environmental Protection Agency administrators. (Majtenyi-IPA)
W79-01210

HYDROLOGY OF THE NEVIN WETLAND NEAR MADISON, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 2H.
W79-01213

ENVIRONMENT, POWER, AND IMPACT ASSESSMENT: THE POLITICS OF INFORMATION,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 6G.
W79-01229

TRADE OFF ANALYSIS IN ENVIRONMENTAL DECISIONMAKING: AN ALTERNATIVE TO WEIGHTED DECISION MODELS,
California Univ., Los Angeles. School of Architecture and Urban Planning.
For primary bibliographic entry see Field 6G.
W79-01242

THE EFFECT OF SOME BASIC STATISTICAL AND BIOLOGICAL PRINCIPLES ON WATER POLLUTION CONTROL,
British Columbia Univ., Vancouver. Faculty of Commerce and Business Administration.
H. D. Drechsler, and P. N. Nemetz.
Water Resources Bulletin, Vol. 14, No. 5, p 1094-1104, October 1978. 7 fig, 1 tab, 11 ref.

Descriptors: *Water pollution control, *Sampling, *Monitoring, Water sampling, Biology, Bioindicators, Pollutants, Water pollution, Water pollution sources, Fish, Toxicity, Damages, Effluents, Regulation, Freshwater, Sea water, Statistics, Analytical techniques.

The hypothesis that the frequently used regulatory practice which employs point estimates in water pollution control objectives, in combination with monitoring at infrequent intervals, is an inadequate scientific procedure for the measurement and control of pollution. The first part of the paper outlined the relevant sampling theory which applies to the measurement of effluent from industrial plants and described the possible errors in sampling practice which currently affect the interpretation and enforcement of environmental standards. In the second part of the paper, the environmental significance of biological damage functions was described briefly. In the final part of the paper, it was recommended that existing pollution control regulations be restructured to be more efficient and effective in the protection of both corporate and social interests. By adopting two different approaches to regulation, depending upon the nature of the appropriate damage functions and critical fish species, it is possible to reduce significantly the waste of resources. (Sims-ISWS)
W79-01243

SALT PICKUP BY OVERLAND FLOW IN THE PRICE RIVER BASIN, UTAH,
Colorado State Univ., Fort Collins. Dept. of Earth Resources.
For primary bibliographic entry see Field 5B.
W79-01245

REAERATION PERFORMANCE OF STEPPED CASCADES,
Birmingham Univ. (England). Dept. of Civil Engineering.
T. H. Y. Tebbutt, I. T. S. Essery, and S. K. Rasaratnam.
Journal of the Institution of Water Engineers and Scientists, Vol. 31, No. 4, p 285-297, July 1977. 9 fig, 9 ref.

Descriptors: *Reaeration, *Dissolved oxygen, *Laboratory tests, *Hydraulic models, Water quality, Hydraulic structures, Rivers, Weirs, Stepdowns, Analytical techniques, Analysis, Model studies, Water temperature, Equations, Overfalls, Foreign research, Stepped cascades.

Reaeratuion was studied in a hydraulic model. A universal cascade structures 150 mm wide was built to permit study of a variety of configurations. Three slopes (H/L) of 1:1, 1:2.5, and 1:5 were investigated with individual step heights (H) of 50, 100, 250, and 500 mm for the 1:1 and 1:2.5 slopes, but omitting the 500 mm step height for the 1:5 slope, which had an overall fall of 1 m compared

with the 2 m fall used for the other two slopes. Most of the work was undertaken with horizontal step treads, but structures with a step length (L) of 250 mm also were studied with 10 deg and 20 deg raked treads. Three standard rates of flow (q) of 1000, 5000, and 12,500 cu m/md were used for all structures, with some additional data collected at intermediate flows. Oxygen deficits in the inflow to the cascade were controlled by the addition of sodium sulphite and cobalt chloride solutions to the suction side of the pump. These studies showed that the reaeration behavior of different cascade structures and flow rates can be conflated into a single plot using parameters describing flow, reaeration, and cascade slope. The main factors controlling reaeration performance in cascades are flow per unit width and total fall with secondary influences due to step height and cascade slope. The reaeration provided by a stepped cascade can be a useful aid in controlling receiving water quality in situations with little dilution and without the expenditure of any additional energy in the treatment process. (Humphreys-ISWS)
W79-01249

REMOVAL AND SEPARATION OF SPILLED HAZARDOUS MATERIALS FROM IMPOUNDMENT BOTTOMS,
Hittman Associates, Inc., Columbia, MD.
M. A. Nawrocki.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 140, Price codes: A05 in paper copy, A01 in microfiche. Final Report No. EPA-600/2-76-245, September 1976. 78 p, 14 fig, 16 tab, 4 ref, 3 append. 68-03-0304.

Descriptors: *Dredging, *Water pollution treatment, *Separation techniques, Hazards, *Filtration, Suspended solids, Water quality control, Impoundments, Ponds, Pumping, Evaluation, Testing, On-site investigations, Efficiencies, Abatement, Slurries, Portable processing systems.

A system for removing spilled hazardous materials from pond bottoms and separating hazardous materials and suspended solids from the resulting dredged slurry was demonstrated. The system consisted of a MUD CAT dredge capable of pumping 1500 gal/m of discharge containing 10% solids, two elevated clarifier bins placed in series, a bank of six 4-inch diameter hydrocyclone cones, a conventional cartridge filter unit, ad a new Uni-Flow bag-type filter. Tests were conducted by placing four different simulatd hazardous materials on the pond bottom to determine efficiency of both removal and separation from the resulting slurry. Results showed 99.3% efficiency of removal for fine iron, fine glass beads, iron filings, and coal. Overall processing separated 99.9% of the iron powder from the slurry and 100% of the other three materials. Testing on removal of latex paint as a real hazardous material gave 95.5% efficiency. Further evaluations and investigations were conductd on the tested apparatus and other equipment that could be used in a full 1500 gal/m portable processing system. A system consisting of a portable scalping-classifying tank combined with spiral classifiers, a Uni-flow filter, and an inclined tube settler was designed and a preliminary analysis was conducted. (Majtenyi-IPA)
W79-01307

COST ESTIMATES FOR CONSTRUCTION OF PUBLICLY-OWNED WASTEWATER TREATMENT FACILITIES. VOLUME 3. SUMMARIES OF TECHNICAL DATA FOR COMBINED SEWER OVERFLOWS AND STORMWATER DISCHARGE. 1976 NEEDS SURVEY,
Environmental Protection Agency, Washington, DC. Office of Water Programs Operations.
J. A. Chamblee.
Available from the National Technical Information Service Springfield, VA 22161 as PB-266 719, Price codes: A18 in paper copy, A01 in microfiche. Rept. Nos. EPA-430/9-76-012, and MCD 48C Vol III of III, Feb 1977 395 p, 16 fig, 37 tab, 67 ref, 4 app. 68-01-1984.

Descriptors: *Waste water treatment, *Costs, *Computer models, *Estimated costs, Sewers, Storm water, Urban hydrology, Urban runoff, Storm runoff, Surveys, Forecasting, Computer programs, Water quality control, Esthetics, Wildlife, Fish, Recreation.

A well defined, consistent nationwide methodology was applied for development of present and 1990 capital, operation, and maintenance cost estimates for combined sewer overflow correction and control of storm waters. Estimates were based on attainment of quality criteria in the areas of esthetics, Fish and wildlife, and recreation. A computer model, called the Needs Estimation Model for Urban runoff, was developed from intensive work with the literature of a detailed analysos of ten specific urbanized areas. The model calculates the combined sewer and stormwater control needs for each urbanized area and then these estimates are summed on a state and territory basis to provide national estimates. The estimated needs obtained using this model are significantly lower than those developd by earlier surveys as a result of the following factors: (1) consideration of receiving water assimilative capacity; (2) a relatively small design storm; (3) a well defined area for storm water control; and (4) a nationwide consistent methodology. Cost estimates for treatment and/or control of stormwater discharges are of better quality variables affecting costs in this area. (Majtenyi-IPA)
W79-01308

IMPLEMENTING 'BEST MANAGEMENT PRACTICES' FOR RESIDUALS: THE WASTE EXCHANGE,
Environmental Protection Agency, Washington, DC. Office of Water Planning and Standards.
A. K. Vitberg, M. L. Rucker, and G. H. Porter.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 068, Price codes: A03 in paper copy, A01 in microfiche. Report Nos. EPA-440/9-76-019 and WPD 6-76-01, September 1976. 26 p, 4 tab, 4 append.

Descriptors: *Industrial waste, *Recycling, *Conservation, *Waste water treatment, Management, Waste exchange, Environmental effects, Information exchange, Economics.

Waste exchage systems are described as a means of dealing with industrial wastes and residuals while, at the same time, using and conserving valuable resources and aiding in imlementing best management practices. Essentially, waste exchange involves extracting potentially valuable materials from wastes and marketing them to users, thus conserving valuable raw materials. Several types of waste exchange systems are distinguished, such as those which limit themselves to transferring information and referring potential sellers and buyers to each other ad those which also physically handle the wastes. Each of these may be subdivided into active or passive systems, depending on whether they seek out potential waste users or wait for users to seek information on wastes. A number of specific design characteristics are tabulated and the role of state and areawide planning agencies is discussed. Appendices described European and American clearinghouses and give examples of the American clearinghouse listings. (Majtenyi-IPA)
W79-01309

A PILOT STUDY OF DRINKING WATER SYSTEMS ON AND ALONG THE NATIONAL SYSTEM OF INTERSTATE AND DEFENSE HIGHWAYS.
Environmental Protection Agency, Washington, DC. Office of Drinking Water.
For primary bibliographic entry see Field 5F.
W79-01312

A MANUAL FOR THE EVALUATION OF A STATE DRINKING WATER SUPPLY PROGRAM,
Environmental Protection Agency, Washington, DC. Office of Drinking Water.
For primary bibliographic entry see Field 5F.
W79-01313

FEASIBILITY STUDY, FLY ASH RECLAMATION OF SURFACE MINES, HILLMAN STATE PARK, FEASIBILITY STUDY,
Ackenheil and Associates Geo Systems, Inc., Pittsburgh, PA.
M. T. Dougherty, and H. H. Holzen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 485, Price codes: A05 in paper copy, A01 in microfiche. Feasibility Report No EPA-600/2/76-183, August 1976. 81 p, 18 fig, 24 tab, 1 append. S-802526.

Descriptors: *Land reclamation, *Strip mines, *Water quality, *Recreation, *Fly ash, Acidic water, Feasibility, Mine drainage, Soils, Soil conservation, Soil physical properties, Hydrogen ion concentration, Particle size, Soil moisture, Costs, Legumes, Grasses, Environmental engineering, Landscaping.

The use of pulverized fuel fly ash for surface treatment of regraded acidic strip mine spoils was studied and found to be technically feasible and suitable for producing a soil cover capable of sustaining grasses and legumes and enhancing abatement of mine drainage. It was determined that fly ash and spoil mixtures are favorable because fly ash neutralizes acidic materials in the spoils and also improves moisture retention characteristics. A feasibility study was carried out for a demonstration project in which fly ash application would be used to reclaim strip mined land which would then be used for recreational purposes. Criteria for water quality for the project were based on data obtained from Hillman State Park in Pennsylvania and also included: pH of the strip mine spoil material and fly ash; moisture retention characteristics of treated and untreated spoils; and grain size distribution of spoils and fly ash treated spoils. It was predicted that alkalinity in the tributaries affected by the demonstration should increase approximately 200 mg/l and that land would be useable. Estimated cost for restoration of the 340-acre demonstration site is about $900,000 and regrading and revegetating will cost an added $70,000. (Majtenyi-IPA)
W79-01323

PROCEEDINGS OF A SYMPOSIUM ON LAND TREATMENT OF WASTE EFFLUENTS CENTER OF ADULT EDUCATION, UNIVERSITY OF MARYLAND, APRIL 25-26, 1978.
Maryland Univ., College Park. Water Resources Research Center.
For primary bibliographic entry see Field 5D.
W79-01329

WATER QUALITY: PROBLEMS AND RESEARCH NEEDS,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 6B.
W79-01348

A WATER POLLUTION SURVEY, MAINLY BY BRITISH SCHOOL CHILDREN,
Nature Conservancy, Abbots Ripton (England). Monks Wood Experimental Station.
K. Mellanby.
Environ Pollut. 6(3), p 161-173, 1974.

Descriptors: *Indicators, *Invertebrates, Maps, Rivers, Species, Streams, Survey, *United-Kingdom, *Water pollution.

A simple kit was used by 8000 children to estimate water pollution in rivers and streams in Britain. The most valuable results were obtained by determining the presence or absence of chosen 'indicator' species of invertebrates. The results compare favorably with existing data professionally collected, but give more details than were previously recorded for many areas. Copyright 1974, Biological Abstracts, Inc.
W79-01354

OPTIMAL OPERATION OF LARGE AGRICULTURAL WATERSHEDS WITH WATER QUALITY CONSTRAINTS,
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 4D.
W79-01355

GEOCHEMISTRY OF MINE EFFLUENTS IN THE FRONT RANGE MINERAL BELT OF COLORADO,
Colorado School of Mines, Golden.
For primary bibliographic entry see Field 5A.
W79-01363

WATER-QUALITY INDICES FOR SPECIFIC WATER USES,
Geological Survey, Oklahoma City, OK. Water Resources Div.
J. D. Stoner.
Circular 770, 1978. 12 p, 1 fig, 8 tab, 7 ref.

Descriptors: *Water quality standards, *Water supply, *Potable water, Irrigation, *Water quality, Water management(Applied), Water utilization, Methodology, *Water quality indices, *Public water supplies.

Water-quality indices were developed to assess waters for two specific uses--public water supply and irrigation. The assessment for a spcific water use is based on the availability f (of (1) a set of limits for each water quality property selected, (2) a rationale for selection, and (3) information that permits one to appraise the relationship of the concentration of the selected property to the suitability of the specific water use. The selected properties are divided into two classes: Type-I properties, those normaly considered toxic at low concentrations, and type-II properties, those which affect aesthetic conditions or which at high concentrations can be considered toxic or would otherwise render the water unfit for its intended use. (Woodard-USGS)
W79-01381

METHOD AND DEVICE FOR SEPARATION OF SUSPENDED MATERIAL FROM A FLUID FLOW,
Paraisten Kalkki Oy, Pargas (Finland). (Assignee).
For primary bibliographic entry see Field 5D.
W79-01392

OIL BOOM FOR DAMMING AND COLLECTING A FLOATING OIL SLICK,
Bridgestone Tire Co., Ltd., Tokyo (Japan). (Assignee).
T. Muramatsu, T. Fukai, and H. Takahashi.
U.S. Patent No. 4,096,700, 11 p, 10 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 971, No 4, p 1339, June 27, 1978.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Water pollution treatment, Water quality control, Floating, Equipment, *Oil booms, Containment, Oil slicks.

An oil boom for damming and collecting a floating oil slick comprises two rows of upper and lower stream side floats spaced apart from each other and partly submerged in water, and a flexible base sheet connected across base portions of the two rows of floats which hangs down into the water in a gently curved shape. Inlet openings are arranged near the upper stream side float and extend in its lengthwise direction; and an inflow guide plate is made integral with the flexible base sheet and is arranged below the inlet openings projecting toward the upper stream side in a direction parallel with the water surface. Outlet openings are arranged in a rear portion of the flexible base sheet and extend in its lengthwise direction. The total opening area of the outlet openings per unit length of the flexible base sheet is larger than that of the inlet openings. (Sinha-OEIS)
W79-01394

ALGAECIDAL COMPOSITION,
Applied Biochemists, Inc., Mequon, WI. (Assignee).
For primary bibliographic entry see Field 5F.
W79-01401

METHODS AND COMPOSITIONS FOR DISPERSING OIL FILMS,
United States Steel Corp., Pittsburgh, PA. (Assignee).
C. Perlaky.
U.S. Patent No. 4,098,694, 4 p, 5 ref; Official Gazette of the United States Patent Office, Vol 972, No 1, p 255, July 4, 1978.

Descriptors: *Patents, *Oil pollution, *Water pollution treatment, *Industrial wastes, *Water quality control, Thin films, Chemical reactions, Organic compounds, Mixing.

This invention provides composition and methods for dispersing thin oil films in water by the use of non-ionic dispersants dissolved in large proportions of organic water-insoluble oxygenated compounds. Such compositions will disperse oil films but are also biodegradable, non-foaming, relatively inexpensive, and are generally unseparated mixtures of alcohols, esters, aldehydes and/or other carbonyl compounds. The invention is also directed towards providing simple means for mixing the dispersing composition with the oil-covered water body. (Sinha-OEIS)
W79-01407

METHOD FOR SEQUESTERING METAL IONS,
Benckiser-Knapsack G.m.b.H., Ladenburg am Neckar (West Germany) (Assignee).
K. Sommer, and G. Raab.
U.S. Patent No. 4,100,067, 5 p, 12 ref; Official Gazette of the United States Patent Office, Vol 972, No 2, p 716, July 11, 1978.

Descriptors: *Patents, *Water treatment, *Water quality control, Industrial water, Water softening, *Scaling, *Corrosion, Organic compounds.

Valuable amino alkane diphosphonic acids in which one or both hydrogen atoms of the amino group are substituted by hydroxy alkane groups, and their alkali metal salts and a process of using them are described. The compounds are highly water-soluble, are stable against hydrolysis even at temperatures exceeding 100C., and have a high sequestering power so that they can be used advantageously in processing aqueous media of considerable hardness, and in suppressing scale and corrosion in aqueous media used for heat treatment of containers. (Sinha-OEIS)
W79-01417

EFFLUENT OIL COLLECTING VESSEL,
Mitsubishi Jukogyo Kabushiki Kaisha, Tokyo (Japan). (Assignee).
S. Uchida, H. Takeshita, and S. Yamazaki.
U.S. Patent No. 4,100,072, 5 p, 2 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 972, No 2, p 718, July 11, 1978.

Descriptors: *Patents, *Oil pollution, *Oily water, *Water pollution treatment, Water quality control, Waves(Water), Jets, Equipment, Suction, Twin-hull vessels.

An effluent oil collecting vessel of twin-hull type is described in which in the space between the opposite hulls, a float-suction section provided with a jet water injection port is hung from the hulls via linkage means so as to continuously follow the waves. There are rubber guides to prevent the effluent oil from leaking backwards through the gaps between the hulls and the float-suction section, and oily water introduced to the float-suction section is sucked by an ejector and fed to a tank in the vessel. (Sinha-OEIS)
W79-01419

STREAM CHANNELIZATION IMPACTS ON SONGBIRDS AND SMALL MAMMALS IN VERMONT,
Massachusetts Univ., Amherst. Dept. of Forestry and Wildlife Management.
For primary bibliographic entry see Field 6G.
W79-01431

WATERFOWL COLLISIONS WITH POWER LINES AT A COAL-FIRED POWER PLANT,
Illinois Natural History Survey, Urbana.
For primary bibliographic entry see Field 6G.
W79-01434

NONMETALLIC ELUTRIATION AND SIEVING DEVICE FOR BENTHIC MACROFAUNA,
Naval Oceanographic Office, Washington, DC. Ocean Science Dept.
R. A. Pedrick.
Limnol Oceanogr. 19(3), p 535-538, 1974.

Descriptors: Benthic fauna, *Elutriation, Heavy metals, Sieving, Instrumentation, Water pollution control.

This simply built device for shipboard use incorporates a tilt adjustable 57-1 drum and an effluent collector of high density polyethylene. The nonmetallic construction removes possible sources of heavy metals contamination; and enclosed elutriation drum top helps prevent spillage.--Copyright 1974, Biological Abstracts, Inc.
W79-01447

POLLUTION ABATEMENT FACILITIES AT NATIONAL FISH HATCHERIES,
Fish and Wildlife Service, Portland, OR.
M. A. Smith.
In: Proceedings of the Northwest Fish Culture Conference, 25th Anniversary, Dec. 4-6, 1974. p 10-14, 5 fig.

Descriptors: *Aquiculture, Fish diets, Fish establishment, Fish farming, *Fish hatcheries, *Wastes, *Waste water treatment, Salmon hatcheries, Washington, *Sedimentation, Solids separation, Lamellar separations, Settling basins, Fish hatchery wastes.

Studies conducted by the Fish and Wildlife Service have indicated that the only pollutant of significance in fish hatchery effluent is fish feces. Control by sedimentation was found to be the only practical method of pollution control tested by the service. (EIS-Katz)
W79-01463

EVALUATION OF CLINOPTILOLITE FOR AMMONIA REMOVAL,
Kramer, Chin, and Mayo, Inc., Seattle, WA.
For primary bibliographic entry see Field 5D.
W79-01464

REVIEW OF R & D ON WATER HYACINTH UTILIZATION IN THE PHILIPPINE REPUBLIC,
Battelle Columbus Lab., OH.
For primary bibliographic entry see Field 4A.
W79-01470

EFFECTS OF SELECTED CHANGES IN THE INSTITUTIONAL AND HUMAN ENVIRONMENT UPON OUTPUT PER UNIT OF INPUT,
Brookings Institution, Washington, DC.
For primary bibliographic entry see Field 6B.
W79-01491

A NOTE ON THE USE OF TAXES TO CONTROL POLLUTION,
Southampton Univ. (England).
M. S. Common.
Scandinavian Journal of Economics, Vol. 79, No. 3, p 346-349, 1977. 2 ref.

Descriptors: *Pollution taxes(Charges), *Pollution abatement, *Economics, *Standards, *Input-output analysis, *Resource inputs, Regulation, Optimization, Costs, Equations, Monitoring, Industrial production, Pollutants, Production function, Welfare(Economics).

Taxing resource inputs may in some circumstances be a more feasible approach to pollution control than a charge on emissions; this has implications not only for achieving arbitrary pollution standards (in which context this argument is developed), but also for securing optimal pollution and for direct controls. Under Baumol and Oates's uniform emission tax, derived from their least-cost theorem, independent cost-minimizing firms meet an overall pollution standard at the least aggregate resource cost to society. However: (1) the feasibility of the uniform charge depends upon the feasibility and cost of monitoring emissions, and (2) though their analysis implies that output is a function of emissions, emissions may usefully be considered a joint product with output; emissions cannot be produced with zero inputs. At least one resource input must be linked to waste emissions, allowing the possibility that waste discharges can be reduced with constant output by increasing some resource inputs. It is demonstrated that there is a set of tax rates on resource inputs which will lead independent cost-minimizing firms to meet an overall pollution standard at the least aggregate resource cost; thus there are the options of taxing either emissions or inputs, the preference presumably dependent on type of pollutant. An advantage of taxing inputs is that firms must monitor their own inputs, but a disadvantage is that the tax rate varies across firms. (Lynch-Wisconsin)
W79-01496

THE 'STANDARDS AND PRICE' APPROACH TO POLLUTION CONTROL: PROBLEMS OF ITERATION,
Newcastle-upon-Tyne Univ. (England).
M. Walker, and D. J. Storey.
Scandinavian Journal of Economics, Vol. 79, No. 1, p 99-109, 1977. 5 fig, 8 ref.

Descriptors: *Economics, *Pollution abatement, *Standards, *Iteration, *Pollution taxes(Charges), Optimization, Costs, Monitoring, Information, Trade-offs, Regulation, Equilibrium, Marginal costs, Pricing.

Critical examination of the iterative procedure used to generate information in calculating pollution taxes shows that it cannot be assumed either that equilibrium tax rates exist, or that where they do exist an iterative method would necessarily yield the standard at minimum resource cost to society. Baumol and Oates (1971) proposed that specific pollution standards be set by some political/scientific mechanism, and that a public authority should set a tax, observe firms' reactions, and utilize this information to calculate the correct tax level. The present study agrees that direct discharge restrictions would require extensive information on simultaneous relationships and on each polluter's marginal costs. But it is argued that Baumol and Oates seriously underestimate the information costs of their own scheme, including the slow, uncertain path to achievement of the standard, plus firms' adjustment costs. There is also an important trade-off between costs of collecting and utilizing a-priori information on the alternatives available for cutbacks, and costs of iteration. This analysis assumes: (1) no change in technology or in relative prices (except environmental); (2) that all changes in effluent load are caused solely by changes in the price/tax rate; (3) that the public authority must achieve the standard with no a-priori information on firms' abatement costs; and (4) that firms attempt to minimize the sum of expected discounted abatement costs and expected effluent taxes. (Lynch-Wisconsin)
W79-01497

AN ECONOMIC EVALUATION OF CROPLAND USE AS A CONTROL FOR SEDIMENT NONPOINT POLLUTION,
Iowa Agriculture and Home Economics Experiment Station, Ames.
J. C. Wade, and E. O. Heady.
Agriculture and Environment, Vol. 3, No. 4, p 307-323, 1977. 6 fig, 3 tab, 12 ref. NSF RANN GI-32990.

Descriptors: *Planning, *Economics, *Alternative planning, *Sediments, *Crop production, *Water pollution control, *Regulation, *Policy, *Land use, Agriculture, Nonpoint pollution, Mathematical models, Model studies, Costs, Cost-benefit analysis, Streams, Soil erosion.

A mathematical model assesses adjustments in agricultural crop production patterns resulting from national regulationl of nonpoint sediment pollution of waters. The model is evaluated with five hypothetical alternatives: (1) unrestricted sediment movement or loads in the stream system; (2) minimizing total national sediment load, and total production and transportation costs; (3) T-limit, which examines stream quality effects of limiting soil loss in each of 105 producing areas (PAs) to the level required to maintain productivity on each class of soil; (4) PA-limit, which restrains cropland sediment load contributions to 20% less than the base solution for each PA; and (5) river basin limit, requiring 20% reduction in the cropland portion of sediment loads at each river basin outflow rather than at the PA level. Four variables are considered: sediment loads to measure environmental improvement, land use and commodity production to measure input-output changes in commodity production, and national production cost to measure national agricultural economic change. The analysis did not indicate a best sediment control policy; all alternatives present major administrative problems. Only the T-limit alternative could be administered without major subsidies to maintain commodity production, but it would require excessive policing. Costs of the minimum sediment alternative greatly exceed benefits. (Lynch-Wisconsin)
W79-01498

THE RESPONSE OF FIRMS TO POLLUTION CHARGES,
Concordia Univ., Montreal (Quebec).
W. A. Sims.
Concordia University Working Paper No. 1977-7, 1977. 33 p, 2 fig, 2 tab, 2 append.

Descriptors: *Economics, *Mathematical models, *Brewing industry, *Pollution taxes(Charges), *Water pollution control, *Sewer effluent charges, *Canada, Effluents, Regulation, Pollution abatement, Economic impact, Model studies, Elasticity of demand, Welfare(Economics), Water demand.

A model incorporating standard neoclassical production theory was used to analyze the response of firms to pollution charges. Sewer effluent charge schemes, currently the only form of effluent charge system in use in Canada, distort water demand by firms subject to them because they allow free base emissions. A method of measuring this welfare loss is suggested. It is pointed out that these free base emissions also affect the response of firms to the actual charges: the reduction of pollution is less than under a comparable pure effluent charge scheme and the firm is induced to increase water volume used to carry away waste (V) with the increase in the dollar charge per pound of emissions (EC). Different theoretical responses of a firm to sewer effluent charges are discussed, and estimates are given of the empirical response of plants in the brewing industry to sewer effluent charges (in particular estimates of conditional elasticities of response functions are given with respect to those charges). Also described are empirical responses of a representative firm in the brewing industry to pure effluent charges and sewer effluent charges. A pure effluent charge is one levied on discharges directly into a water body rather than into a sewer. Data used in the analysis were derived from study of the brewing industry in Canada. (Lynch-Wisconsin)
W79-01499

MARKET INPUT/OUTPUT STUDIES. TASK I. VINYLIDENE CHLORIDE,
Auerbach Associates, Inc., Philadelphia, PA.
For primary bibliographic entry see Field 6B.
W79-01500

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

REGIONAL WATER SUPPLY CAPACITY EXPANSION WITH SEASONAL DEMANDS AND ENERGY COSTS,
California Univ., Los Angeles. Dept. of Engineering Systems.
C. Steiner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 671, Price codes: A08 in paper copy, A01 in microfiche. Thesis, Master of Science in Engineering, 1977. 149 p, 33 fig, 12 tab, 73 ref. (California Water Resources Center Project UCAL-WRC-W-518) OWRT A-062-CAL(1).

Descriptors: *Planning, *Model studies, *Water storage, *Reservoirs, *Aqueducts, Water quality, Water rates, Water demands, Seasonal, Water supply, Regional analysis, Storage capacity, Energy costs, Cost analysis, Marginal costs.

A multi-planning period cost minimizing model is presented for a large scale regional water storage and transport system in which (price insensitive) seasonal demands are assumed nondecreasing with time. The structure of the water system consists of 'collecting' reservoirs upstream at supply points, 'demand' reservoirs downstream at demand points and aqueducts linking them all. Mixed interger programming is used to minimize the sum over time of discounted costs of constructing and operating the aqueducts and reservoirs in the system so that seasonal demands are met. Major transport pumping costs are explicitly included assuming a seasonal electric power rate schedule. Optimal construction timing, sequencing, sizing and operating of the system components is computed in a framework which facilitates the trade-off of reservoir and aqueduct capacities where naturally occurring supplies and seasonal demands are timewise out of phase. Instream water quality requirements constitute environmental quality constraints on the quantity supply model. Under certain assumptions, demand constraint dual variables may be interpreted as seasonal marginal costs for bulk water supply. Use of these marginal costs as the basis for determining the seasonal price of bulk water is discussed. Parameterization of energy costs for pumping is used to derive season-specific water system demand curves for electric power. (Snyder - Calif, Davis)
W79-01002

RECONCILIATION OF APPARENT NONEQUIVALENCE AMONG ALTERNATIVE RATING METHODS,
California Univ., Berkeley. School of Public Health.
For primary bibliographic entry see Field 6B.
W79-01240

TRADE OFF ANALYSIS IN ENVIRONMENTAL DECISIONMAKING: AN ALTERNATIVE TO WEIGHTED DECISION MODELS,
California Univ., Los Angeles. School of Architecture and Urban Planning.
For primary bibliographic entry see Field 6G.
W79-01242

OPTIMAL OPERATION OF LARGE AGRICULTURAL WATERSHEDS WITH WATER QUALITY CONSTRAINTS,
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 4D.
W79-01355

RESOURCE EXTRACTION AND RECYCLING WITH ENVIRONMENTAL COSTS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Economics.
M. Hoel.
MIT Department of Economics, Working Paper No. 197, April 1977. 37 p, 7 fig, 3 tab, 22 ref. NSF SOC 75-14258.

Descriptors: *Resource extraction, *Costs, *Recycling, *Non-renewable resources, *Economics, *Resource substitution, Optimization, Model studies, Mathematical models, Environmental effects, Residuals, Waste disposal, Exhaustible resources.

A microeconomic partial analysis of the effect of environmental costs on optimal resource extraction includes the possibility of either recycling or a backstop technology able to produce a perfect resource substitute. This research emphasizes the effect of the cost of recycling or producing the substitute on resource extraction and development of harmful residuals or other negative environmental impacts. Resource extraction and recycling never take place simultaneously in the cases studied; at first only extraction takes place, with the optimal extraction rate declining over time. When recycling starts the rate is either constant or declining; in the latter case recycling approaches a stationary level, positive only if there is some natural degrading of harmful residuals. Because of environmental effects it may be preferable to leave part of a resource stock unextracted; but in any case the optimal path of extraction will be affected by the environmental effects. The stock of harmful residuals will usually be affected by recycling costs both in the long run and when resource extraction stops, true also for the initial growth of harmful residuals, determined by initial resource extraction. For most cases initial resource extraction and growth of harmful residuals increases inversely to the recycling cost. Though somewhat surprising, this result corresponds to the usual situation where initial extraction is higher the lower is the cost of producing a substitute. (Lynch-Wisconsin)
W79-01492

COMPUTERIZED COSTING MODEL FOR INLAND WATERWAYS BARGE TRANSPORTATION,
Missouri Univ., Rolla.
M. L. Smith, H. E. Metzner, and W. A. Brooks.
Interfaces, Vol. 8, No. 4, August 1978, p 31-37. 3 fig, 2 ref.

Descriptors: *Barges, *Inland waterways, *Computer models, *Cost analysis, *Transportation, *Economics, Costs, Alternative costs, Model studies, Analytical techniques, Optimization, Computer programs, Dedicated towing service, General towing service, Trucking, Railroads, Methodology.

A computer program is described which provides cost information on barge movements on the inland waterways system. The underlying model covers all aspects of barge costing: (1) linehaul costs, (2) terminal csts at the origin, and (3) destination, cargo insurance, and inventory expenses for both general and dedicated towing services. The costing program is currently being used by the Phillips Petroleum Company and the Missouri Pacific Railroad. The computerized system saves time (one day instead of 50-60 days for an average study) and cost (up to $20,000 per year) in generating data, and eliminates calculation errors. The barge cost optimization model calculates: (1) transit/terminal and interchange times, (2) towing costs for each towing service, (3) barge ownership costs, and (4) miscellaneous shipping costs. In each contemplated movement the shipper must weigh the total incurred cost for utilizing dedicated vs general towing service. If volume is sufficiently high, dedicated towing service often offers reduced barge ownership and towing costs on a distributed basis (per net ton), plus faster and more uniform round-trip times; volume insufficient for dedicated towing service should utilize general towing service. It is recommended that a total barge-incurred cost curve (illustrated) be constructed for varying amounts of tonnage in the vicinity of a shipper's anticipated annual tonnage. This model may be applicable to trucking and railroads as well as barges. (Lynch-Wisconsin)
W79-01493

AN ALTERNATIVE PERSPECTIVE ON COMMON PROPERTY RESOURCE ALLOCATION DECISIONS IN THE COASTAL ZONE,
Texas A and M Univ., College Station. Dept. of Political Science.
G. C. Swanson, J. L. Seymour, and R. B. Ditton.
Coastal Zone Management Journal, Vol. 4, No. 1-2, 1978, p 25-45. 1 fig, 1 tab, 24 ref.

Descriptors: *Resource allocation, *Coastal zone management, *Political aspects, *Decision making, *Public sector, *Private sector, Common property, Coasts, Management, Coastal Zone Management Act, Shore protection, Beach erosion, Reefs, Artificial reef, Wetlands, Analytical techniques, Methodology, Governments.

Roles and responsibilities of the public and private sectors in coastal zone management are reevaluated, and an alternative mechanism for determining the proper use of the two sectors in common property resource allocation decision-making is presented. It is proposed that a 'sectoral responsibiligy analysis' be formally adopted at all levels of government to clarify where, when, and in what way government should act in coastal zone management. Instead of considering consumer utility as the criterion of agency effectiveness, bureaucratic institutions set up to handle such matters all too often assess performance on the basis of producer efficiency. Civil servants tend to substitute their priority schedules for the laws of the flawed free market as an allocation mechanism. The proposed analysis would include: (1) description of the present situation and problem (natural setting and processes, public-private interest and relationships); (2) relative strengths of the two sectors in their ability to cope with allocation decisions; (3) deficiencies of each sector in allocation ability; and (4) alternative mechanisms available to allocate resources with recognition of interrelationships. This paper contains: (1) a conceptual analysis of the relative strengths and weaknesses of the public and private sectors in resource decision-making, and (2) an examination of three examples of coastal resources management--beach and shorelands protection, artificial reefs, and coastal wetlands. (Lynch-Wisconsin).
W79-01494

RENEWABLE RESOURCE MANAGEMENT AND EXTINCTION,
British Columbia Univ., Vancouver. Dept. of Mathematics.
C. W. Clark, and G. R. Munro.
Journal of Environmental Economics and Management, Vol. 5, No. 2, June 1978, p 198-205, 2 fig, 10 ref.

Descriptors: *Renewable resources, *Optimization, *Extinction, *Economics, *Autonomous models, *Nonautonomous models, *Natural resources, Management, Model studies, Mathematical models, Discount rates, Equity, Policy, Marginal return, Marginal benefits.

Arguments supporting the proposition that extinction of a biological resource could be consistent with a policy of maximizing the discounted present value of economic rent have been based on models in which parameters are assumed to remain constant over time. This paper examines the consequences of relaxing this assumption, while retaining two other questionable ones: (1) that future parameter values, while not necessarily constant, are known with certainty; and (2) that questions of intergenerational equity are adequately represented by the usual present value criterion. Previous authors have held that a necessary and sufficient condition for the optimality of an extinction policy is simply that the own-rate-of-interest of the resource stock be less than the discount rate at all stock levels greater than zero. Since biological extinction is irreversible, such necessary and sufficient conditions are inadequate as they rest upon current information alone. Unfortunately, the own-rate-of-interest decision rule apparently has no simple extension to the general situation, and each case must be investigated on its own. In the nonautonomous case it is shown that extinction is never an optimal policy unless the marginal net return from harvesting the last unit of the resource exceeds the marginal net benefit to be enjoyed from conservation. This condition must be added to the necessary and sufficient conditions of the autonomous model, and it is often difficult to determine whether it has been satisfied. (Lynch-Wisconsin)
W79-01495

6B. Evaluation Process

REGIONAL WATER SUPPLY CAPACITY EXPANSION WITH SEASONAL DEMANDS AND ENERGY COSTS,
California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 6A.
W79-01002

A SOCIETAL ASSESSMENT OF THE PROPOSED SIERRA SNOWPACK AUGMENTATION PROJECT,
Human Ecology Research Services, Inc., Boulder, CO.
For primary bibliographic entry see Field 3B.
W79-01063

CITIZEN PARTICIPATION FOR SUCCESSFUL VILLAGE WATER SUPPLY,
M. Elmendorf, and M. McGarry.
Civil Engineering, Vol. 148, No. 8, 68-70, August, 1978.

Descriptors: *Water supply, *Community development, *Water managemen(Applied), Water resources development, Water utilization, Water wells, Pipelines.

Developing countries which lack adequate supplies of safe drinking water need inexpensive water supply systems which can be easily maintained. Local participation in planning and building is the key for success in water management programs. An example of this is a water supply project in Santa Mario, Mexico. The villagers formed a water committee to collect money for the initial construction and continual maintenance of a well. Villagers were trained in drilling and well maintenance by WHO and UNICEF. The success of this project inspired another Mexican village to replicate it. In Malawi and Kenya, water piped from distant rivers has improved public health and the time and effort previously spent hauling water can now be spent more productively. Engineers can do the technical planning to solve water supply problems but the human element at the grassroots level must be included for effective utilization and management. (Purdin-NWWA)
W79-01112

THE MANAGEMENT OF GROUNDWATER SUPPLIES,
Ground Water Consultants Group, Edmonton (Alberta).
For primary bibliographic entry see Field 4B.
W79-01117

IMPACT OF FLOODS AND ALTERNATIVE FLOOD CONTROL MEASURES ON THE DEVILS LAKE BASIN ECONOMY,
North Dakota State Univ., Fargo. Dept. of Agricultural Economics.
D. F. Scott, and J. A. Leitch.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 830, Price codes: A06 in paper copy, A01 in microfiche. North Dakota Water Resources Research Center, Research Project Technical Bulletin. August 1976. 119 p, 1 fig, 54 tab, 8 append. OWRT A-043-NDAK(1), 14-31-0001-5034.

Descriptors: *Watershed management, *Evaluation, *Economic impact, Flood damage, Flood control, Wetlands, Wildlife, Agriculture, *Alternative planning, *Devils Lake Basin(ND), *North Dakota.

An overview is provided of the Devils Lake Basin regional economy and the economics of alternative plans to reduce flood damages in the Basin are evaluated. Baseline data on employment, income, sales of selected sectors, and federal government outlays were collected from secondary sources. Two surveys of farm operators in the Basin were conducted to obtain information on flood damages, attitudes toward wetlands, and crop losses due to wildlife.
W79-01122

URBAN RUNOFF POLLUTION AND WATER QUALITY PLANNING,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 5B.
W79-01134

NON-RESIDENT HUNTERS--BENEFACTORS OR BAD MEN.
North Dakota State Univ., Fargo. Dept. of Agricultural Economics.
J. A. Leitch.
North Dakota Outdoors. Vol. 40, No. 2, p 19-21 August, 1977. OWRT B-034-NDAK(2), 14-34-0001-7127.

Descriptors: *Hunting, Big game, Small game, Waterfowl, Permits, Regulation, *Costs, *Recreation, *North Dakota, Devils Lake, Rugby.

The numbers and origins of non-resident hunters who came to North Dakota during the 1976 hunting season are analyzed. Some of the costs and regulations involved for non-resident hunters are discussed.
W79-01138

BUILDING PUBLIC/PRIVATE COOPERATION IN THE COASTAL ZONE,
Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 6E.
W79-01145

PUBLIC INVOLVEMENT IN NATURAL RESOURCE DEVELOPMENT: A REVIEW OF WATER RESOURCE PLANNING,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Div. of Environmental and Urban Systems.
G. A. Daneke.
Environmental Affairs, Vol 6, No 1, p 11-31, Winter, 1977.

Descriptors: *Alternative planning, *Project planning, *Decision making, *Planning, Non-structural alternatives, Administration, Programs, Comprehensive planning, Water law, Legal aspects.

Efforts to increase citizen involvement in environmental policy-making have been fragmented, even though public environmental concern has increased. Water resource policy could benefit by the participatory movement; planning and policy-making are decentralized, dependent upon local support and involvement, and water agencies have acquired standards and requirements for public decisional involvement. However, water development agencies have separated participation from planning, and have contacted the public only after completion of planning. The 1970 federal Flood Control Act instructed water resource agencies to consider the well being of a region's residents, and suggested that direct public input into regional planning should be instrumental. This prompted the U.S. Army Corps of Engineers to instruct its regional representatives to present information to the public to help define water resource priorities, develop input channels, provide structured opportunities for public influence, and promote coordination with other planning agencies. An innovative approach known as 'Fishbowl Planning' couples workshops and public meetings with citizen committees and feedback brochures. While this method has proved helpful, it isolates conflicting interest groups. Alternative procedures might produce greater public participation in the planning process. (Rule-Florida)
W79-01153

ENERGY AND THE COLORADO RIVER,
Utah State Univ., Logan. Dept. of Economics.
For primary bibliographic entry see Field 3E.
W79-01167

THE TENNESSEE VALLEY AUTHORITY'S TELLICO DAM PROJECT-COSTS, ALTERNATIVES, AND BENEFITS.
General Accounting Office, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 851, Price codes: A06 in paper copy, A01 in microfiche. Report to the Congress by the Comptroller General of the United States, October 14, 1977, 98 p, 9 append.

Descriptors: *Tellico Dam(TN), *Cost-benefit analysis, *Tennessee Valley Authority, *Alternative planning, *Snail darter, *Environmental effects, *Little Tennessee River Valley(TN), *Endangered species, *River basin development, Legislation, Judicial decisions, Political constraints, Fish, Dam, Reservoirs, Tennessee, Land use, Agriculture, Sport fishing, Recreation, Legal aspects, Social values, Rivers, Valleys, Problem identification and ranking.

Issues in halting the Tennessee Valley Authority's nearly completed Tellico Dam project are reviewed; the U.S. General Accounting Office recommends that Congress should: (1) prohibit TVA from further work on the project, and (2) not exempt the project from the Endangered Species Act until more current information is received. The $116 million project, for which $103 million has been spent, was stopped January 1977 because it would harm or destroy the habitat of the snail darter, a small fish which has been found only in the Little Tennessee River near the proposed reservoir. It is here maintained that the problem of the snail darter (700 of which have been transplanted to the Hiwassee River) is only part of the broader issue of whether the Tellico project is the best use for the Little Tennessee River Valley. It is contended that alternative uses were not adequately considered by TVA, that the original cost-benefit data from 1968 is now out of date, and that TVA's analysis was based on faulty methodology. Such issues as archaelogical preservation, agricultural land use, trout populations, and a possible Scenic Rivers designation need to be evaluated. Costs and benefits that would arise if the dam is not completed are assessed, as well as legal and environmental considerations. TVA criticisms are responded to in an appendix. Abandonment of the project will require removal of part of the completed dam to protect the snail darter. (Lynch-Wisconsin)
W79-01193

RECONCILIATION OF APPARENT NONEQUIVALENCE AMONG ALTERNATIVE RATING METHODS,
California Univ., Berkeley. School of Public Health.
W. H. Bruvold.
Journal of Applied Psychology, Vol. 62, No. 1, p 111-115. 1977. 2 fig, 10 ref. (California Water Resources Center Project UCAL-WRC-W-359).

Descriptors: *Graphical methods, *Least squares method, Numerical analysis, Graphical analysis, Mathematical studies, Attitudes, Alternative rating methods, Measurement, Social values.

Past results showing nonequivalence between successive-intervals (representational) and category rating (index) measures are due to over-simplified graphical methods of successive-intervals analysis employed in previous studies. This proposition was tested using 107 subjects and 141 attitude items, and was confirmed, indicating that results from category rating and successive-intervals scales may be equivalent and that the former may have more research value than previously believed. (Snyder-Calif Davis)
W79-01240

A MANUAL FOR THE EVALUATION OF A STATE DRINKING WATER SUPPLY PROGRAM,
Environmental Protection Agency, Washington, DC. Office of Drinking Water.
For primary bibliographic entry see Field 5F.
W79-01313

INLAND WETLAND DEFINITIONS,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 6E.
W79-01335

WATER QUALITY: PROBLEMS AND RESEARCH NEEDS,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
W. Whipple, Jr., and M. M. Hufschmidt.
Water and Sewage Works, p 40-41, December 1976. OWRT B-062-NJ(2). 14-31-0001-5134.

Descriptors: *Management, *Institutions, *Research priorities, *Urban runoff, *Water quality, Cities, Urbanization, *Urban water quality, *Urban-related water resources research, Urban hydrology, Research policy.

Findings and recommendations are presented of the water quality group of a workshop held at Quail Roost, N.C. to discuss reorientation of water resources research. The findings indicate that the costs of applying nationally applicable effluent standards nationwide would be out of proportion to the benefits obtained, that a new and more flexible planning strategy should be applied, that current areawide water quality planning is apt to be ineffective on account of lack of data and deficiency in technology relative to urban runoff pollution, that better methodology to integrate water supply and water pollution problems should be devised, and that institutional arrangements for pollution control require further investigation.
W79-01348

THE WATER FACTOR IN THE SOCIAL HISTORY OF HONOLULU, HAWAII,
Hawaii Univ., Honolulu.
P. F. Senecal.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 160, Price codes: A14 in paper copy, A01 in microfiche. Doctoral Dissertation, August 1977. 278 p, 208 fig, 5 tab, 109 ref. OWRT A-051-HI(1).

Descriptors: *Water resources, *Hawaii, *Water resources development, *History, Water supply, Confined water, Social aspects, Community development, Water demand, Population, Aesthetics, Parks, Landscaping, Architecture.

The social history of Oahu is presented from an environmental perspective with emphasis on water resource utulization on the island. The interaction of public administraton, technology, and aesthetics is discussed as the island community progressed from a rural to an urban environment. The history of the island's water supply is traced from the situation in 19th century Honolulu through the discovery and effect of artesian water to the formation of the Board of Water Supply. The decline of natural water features in two of Honolulu's important parks, Moanalua and Kapiolani, is examined and the quality and quantity of man-made water features in contemporary Honolulu and their role in the lives of residents is discussed. The discussion is illustrated by over 200 photographs of natural and architectural water-related sites. (Majtenyi-IPA)
W79-01353

ANALYSIS OF WATER FLOW PROBLEMS IN THE HELLS CANYON OF THE SNAKE RIVER,
Idaho Univ., Moscow. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W79-01359

QUANTIFICATION OF RECREATIONAL USE OF THE CORALVILLE RESERVOIR,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
T. E. Croley, II, and R. Chen.
Available from the Technical Information Service, Springfield, VA as PB-288 947, Price codes: A04 in paper copy, A01 in microfiche. IIHR Report No. 185, March 1976. 48 p, 8 fig, 14 tab, 38 ref, 1 append. OWRT A-054-IA(5), 14-34-0001-6016.

Descriptors: *Multiple purpose reservoirs, *Iowa, *Recreation, *Estimating, *Water resources development, Water utilization, Project planning, Water demand, Human population, Forecasting, Reservoir operation, Fluctuations, Coralville Reservoir(Iowa), Operations research.

An attempt was made to estimate recreational use of the Coralville Reservoir near Iowa City, Iowa, for use in objective trade-off studies. A quantitative measure was derived from available data which is applicable for detrmining reservoir operation effects on an index of recreational use for the reservoir. This measure relates recreational use expressed in visitor-says, pool area, seasonal variations, and population of surrounding areas. This is not to be interpreted as a forecast of recreational demand but is intended to idicate operational effects on recreation use. Two limitations of the measur are that it was derived from existing operating rules in which reservoir pool elevation was mainted above minimum limits, and that it does not reflect the greater loss resulting from downward pool fluctuations. It is recommended that successive studies which use the value function derived in this investigation should also make explicit consideration of minimum pool and pool fluctuations during the recreation season. (Majtenyi-IPA)
W79-01361

ECONOMIC VALUE OF HUNTING, FISHING, AND GENERAL RURAL OUTDOOR RECREATION,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
W. E. Martin, and R. L. Gum.
Wildlife Society Bulletin, Vol. 6, No. 1, p 3-7, 1978. 3 tab, 6 ref.

Descriptors: *Arizona, *Economics, *Recreation, *Hunting, *Sport fishing, *Resources development, Land resources, Natural resources, Land management, Recreation demands, Competing uses, Water resources development, *Economic Value, *Revenue Value.

The basic interpretation of monetary values of natural resource areas for outdoor recreation is summarized. Then, based on a detailed study of recreation in Arizona, estimated monetary values for resource areas in use for hunting, fishing, and general rural outdoor recreation are presented. Two measures of monetary value are used-the total benefit value and the maximum collectable revenue value. Total benefits for deer hunting, general hunti, cold water fishing, warm water fishing, and all other general rural outdoor recration activities in Arizona in 1970 were estimated to be $243 illion. The maximum collectable revenue for these same acitivities would have been $87 million. As an illustration ofthe usefulness of these monetary value estimates, selected estimates are converted to values per square kilometer for comparison with values ofthe basic land when used for cattle production. For example, one square kilometer of huntable range in Manafement Region 5 had an average value of $229 in use for hunting, while the average sale value for cattle ranching was only $137. (EIS-Katz)
W79-01430

CONFERENCE PROCEEDINGS - A CRITICAL ECONOMIC BALANCE, WATER - LAND - ENERGY - PEOPLE - HELD AT COLORADO STATE UNIVERSITY, PINGREE PARK CAMPUS ON JUNE 6-7, 1977,
Denver Federal Executive Board, CO.
P. Garrett, G. Kissinger, and J. Newlin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 089, Price codes: A06 in paper copy, A01 in microfiche. Report FEA/77-8-6, June 1977. 105 p, 8 fig. Prepared for Federal Energy Administration, Region VIII, Lakewood, Colorado. P. Garrett, G. Kissinger, and J. Newlin (Editors).

Descriptors: *Energy, *Regional development, *Rocky Mountain Region, *Great Plains, *Southwest U.S., *Planning, *Natural resources, Environmental effects, Economics, Coals, Nuclear energy, Institutional constraints, Oil industry, Financing, Regional analysis, Regions, Land use, Policy, National Energy policy, Federal government, Forecasting, Management, Water supply, Land, Human resources, Agriculture, Environment, Solar energy, Geothermal energy.

A conference on the critical economic balance between water, land, energy, and people in the western states was held at Pingree Park, Colorado, 6-7 June 1977, sponsored by two Colorado-based agencies in cooperation with the Federal Energy Administration Region VIII. Objectives were to: (1) encourage regional coordination in the delivery of services and programs dealing with water, energy, land, and population growth; (2) stimulate analysis of issues, responsibilities, and directions for effective economic planning; and (3) develop recommendations for decision-makers in government, business, industry, and the public for achieving regional and national economic balance. Twelve papers deal with: (1) coordinated energy management, (2) the national energy plan, (3) legitimacy of western identity in an economic balance, (4) economic impact of water supply and demand, (5) regional implications of national energy-employment relations, (6) industry's role in energy management, (7) visualizing alternative futures for population growth and socio-economic balance, (8) issues in achieving an economic balance, (9) fragile lands and people, (10) private capital market, (11) planning and conservation in coal development and reclamation, and (12) goals for energy development. Background and economic concerns are given for Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming, and numerous long- and short-term objectives identified by participants are listed. (See W79-01479 thru W79-01490) (Lynch-Wisconsin)
W79-01478

COORDINATED ENERGY MANAGEMENT,
Federal Energy Administration, Lakewood, CO. Socioeconomic Program and Data Collection Office.
P. G. Garrett.
In: Conference Proceedings - A Critical Economic Balance - Water - Land - Energy - People, June 6-7, 1977. Colorado State University, Pingree Park Campus. p 18-22.

Descriptors: *Energy, *Management, *Planning, *Decision making, *Policy, *Coals, *Natural resources, Government, Agriculture, Water, Water utilization, Water supply, Water demand, Political constraints, Water management, Rural areas, Economics, Economic development, Rocky Mountain Region, Great Plains, Southwest U.S.

A discussion of energy management, emphasizing western states included in Federal Energy Administration Region VIII, calls for cooperative and coordinative: (1) financial planning to ameliorate energy impact on rural areas; (2) technology assessment and decision-making strategies relative to the agricultural economy; and (3) multiple-purpose water management. The U.S. economy, and especially that of the western states, is critically dependent on energy employment. It is also dependent on the federal government de-emphasizing an advocacy relationship. This paper examines: (1) coal development and rural development, (2) agriculture, and (3) water. Negative effects of energy on a community associated with coal development range from those on revenue raising and expenditures to those on informal support systems and secondary employment networkds. Coordinated energy management is essential for policy analysis and implementation. Consideration should be given to administrative simplicity, flexibility, equity, risk minimization, timeliness, economic efficiency, and political feasibility. In the western states major industries and businesses are primarily agricultural or energy-related. Water used for increased energy production need not be lost to other water consumption demands. Multiple-purpose water management is necessary for coordinated energy management mechanisms. (See also W79-01478) (Lynch-Wisconsin)
W79-01479

THE NATIONAL ENERGY PLAN,
Federal Energy Administration, Lakewood, CO. Region VIII.
D. E. Faver.
In: Conference Proceedings - A Critical Economic Balance - Water - Land - Energy - People, June 6-7, 1977, Colorado State University, Pingree Campus. p 22-26.

Descriptors: *Energy, *Planning, *Policy, *Federal government, *Oil, *Costs, *Natural resources, Department of Energy, National Energy Policy, Demand, Conservation, Imports, Coals, Solar energy, Geothermal energy, Nuclear energy, Natural gas.

The Carter Administration has taken two approaches to the problem of energy supply: (1) creation of a Department of Energy to coordinate effort and centralize responsibility, and (2) submission to Congress of a national energy policy. The latter includes several basic components: (1) reducing annual growth of energy demand to under 2%; (2) reduction of oil and gas imports from 16 million barrels/day to six million barrels; (3) shifting from oil to coal use by increasing coal production more than 60%; (4) increasing total annual U.S. energy production from the present 660 million tons to over one billion tons by 2985; (5) reducing gasoline consumption by 10%; (6) insulating 90% of residences and other buildings; and (7) installing solar energy systems in over 2.5 million homes. The underlying objective is to distribute evenly the real cost of energy in BTUs, whether from natural gas, coal, petroleum, or other source. The cornerstone of the policy is conservation--saving energy, eliminating waste, and efficient energy use. Oil and gas are speculative energy sources. Coal is of great current importance, and nuclear power should be strongly considered. Solar and geothermal energy have much potential, but are not immediately available in sufficiently large quantities. (See also W79-01478) (Lynch-Wisconsin)
W79-01480

LEGITIMACY OF WESTERN IDENTITY IN AN ECONOMIC BALANCE WATER - LAND - ENERGY - PEOPLE,
Federation of Rocky Mountain States, Denver, CO. Western States Energy Policy Office.
P. Burgess.
In: Conference Proceedings - A Critical Economic Balance - Water - Land - Energy - People, June 6-7, 1977. Colorado State University, Pingree Park Campus. p 27-31.

Descriptors: *Multi-state institutions, *Regional economics, *Western governors policy office, *Institutional constraints, *Planning, *Natural resources, *Regional development, Regional analysis, Regions, Research and development, Institutions, Water, Energy, Land, Economics, Policy, Rocky Mountain Region, Great Plains, Southwest U.S.

A conference paper which describes recent reorganizational events among multi-state institutions in the western states of the Federal Energy Administration's Region VIII, concludes that regional or multi-state institutions are most valuable in providing economies of scale or divisions of labor, and

much less for the few genuine regional problems. the 15-state Western Governors' Task Force on Regional Policy Management, brought together at the National Governors' Conference (July 1976), later investigated proliferation of multi-state institutions in the western states, and their ability to deal with water, energy, and environmetal concerns. Over 100 multi-state institutions were identified, 40% in natural resources, 20% in human resources, 12% in agriculture, and the rest in telecommunications, transportation, and the like. The Western Governors' Policy Office is to replace several other institutions, including the Western Governors Regional Energy Policy Office and the Western Federation of Rocky Mountain States; it also incorporates activities of the Western Interstate Nuclear Compact. The Governors serve as board of directors, and will have an interim board called the Regional Coordinating Council with policy offices in energy, agriculture, natural resources, human resources, and water. (Lynch-Wisconsin)
W79-01481

WATER -- DEMAND AND SUPPLY: ECONOMIC IMPACTS,
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
K. Kauffman.
In: Conference Proceedings - A Critical Economic Balance - Water - Land - Energy - People, June 6-7, 1977, Colorado State University, Pingree Park Campus. p 32-38.

Descriptors: *Water demand, *Water supply, *Economic impact, *Energy, *Water policy, *Federal government, *Water resources development, *Water allocation(Policy), *Natural resources, Rocky Mountain States, Great Plains, Southwest U.S., Water conservation, Economic development, Economics, River basins, Colorado River Basin, Missouri River Basin, Water consumption(Except consumptive use), Policy, Regional development, Water rights.

The role of water in national economic development is discussed, with special attention to energy and to the federal government's water policy. The discussion focuses on western states of the Federal Energy Administration'S Region VIII. In the upper and lower Colorado River basin water will probably limit energy development, but not in the upper Missouri River basin. Average annual water supply in the upper Colorado basin is about 5.8 million acre-feet, of which 3.7 million is actually consumed, leaving only 2.1 million for additional development. Estimated water demand for the year 2000 is over 2.5 million acre-feet of additional water, for energy, municipal and industrial use, agriculture, fish and wildlife, and recreation. The upper Missouri basin has an annual flow of 28 million acre-feet, of which only six million is used. The era of major federally funded water development in the United States is ending; federal water planning will now focus on national economic development, environmental quality and water conservation. Regional development has ceased to be sanctioned as a national water resources policy objective. At the National Water Conference Secretary of the Interior Andrus indicated that nonstructural water planning and management measures will have equal status with structural ones, non-federal entities will be required to bear a larger share of project costs, and water allocation practices will be reviewed and revised. (See also W79-01478) (Lynch-Wisconsin)
W79-01482

REGIONAL - IMPLICATIONS - OVERVIEW OF NATIONAL ENERGY EMPLOYMENT RELATIONS,
Department of Labor, Washington, DC. Office of the Under Secretary.
W. Nordlund.
In: Conference Proceedings - A Critical Economic Balance - Water - Land - Energy - People, June 6-7, 1977, Colorado State University, Pingree Park Campus, p 38-41.

Descriptors: *Regional development, *Employment, *Energy, *National Energy Plan, *Policy, *Human resources, *Natural resources, Rocky Mountain States, Great Plains, Southwest U.S., Federal government, Political constraints, Social overhead, Coals, Employment opportunities.

Employment aspects of the Nationall Energy Plan are discussed with emphsis on the western states. Direct employment in the energy sector represents about 2% of the labor force (about two million workers). Although there are some seven million unemployed in the U.S., most have neither the skill nor experience required for an expanded energy work force. In addition, the unemployed tend to be located in large metropolitan areas, while energy jobs usually occur in nonurban areas. Rapid expansion of 'boom towns' in the Rocky Mountain region due to energy development has been accompanied by inadequate roads, schools, hospitals, water supply, sewers, and tax base, and high job turnover and employee absenteeism. Project delays, falling productivity, and rising production costs often follow. There is typically an inverse relationship between unemploymet and job turnover. The Department of Labor can do little to alleviate such problems, apart from providing information, training, and motivation seminars. Aspects of the National Energy Plan which will affect employment in the West include: (1) large-scale coal development; (2) transportation of 400-500 MTPY of coal; (3) impact of power plant construction and coal mine operation on worker turnover, productivity, and absenteeism; and (84) major flows of new workers into the region. (See also W79-01478) (Lynch-Wisconsin)
W79-01483

THE INDUSTRY'S ROLE IN ENERGY MANAGEMENT,
Peabody Coal Co., Denver, CO. Regional Counsel's Office.
D. Sturges.
In: Conference Proceedings - A Critical Economic Balance - Water - Land - Energy - People, June 6-7, 1977, Colorado State University, Pingree Campus. p 42-55.

Descriptors: *Industries, *Energy, *Coals, *Policy, *Management, *Strip mines, *Coal mines, *Natural resources, Air pollution, Rocky Mountain Region, Great Plains, Southwest U.S., Federal government, Regional development, Environmental effects, Planning, Social aspects, Economics.

Past, present and future roles and problems of industry in energy management are discussed. The analysis is from the prespective of the coal strip mining industry in the western states. Energy companies at the current state of development should: (1) make full and open disclosures of energy development plans, including measures for minimizing effects on the environment; and (2) participate earlier at all levels of public policy development, to help establish appropriate legal and institutional mechanisms. Industry traditionally has responded to market forces, rather than controlling them; it finds coal, determines its quality, assembles the land package, extracts the coal, and markets it. Most environmetal and socio-economic impact research for permit applications is contracted to outside firms, and is not done within the industry. In the past, industry has not been an initiator or innovator in public policy-making institutions or processes, reacting instead to proposed or current public policies. Industry has generally stimulated employment and public revenue, but has not participated with public agencies in management of socio-economic consequences. Western coal is primarily federal coal; the real land/coal ownership pattern is a checkerboard of federal coal interspersed with private or fee-coal. Problems facing the industry include permit delays, capital formation, coal leasing, air pollution control, salinity control, and public opposition to operations at various mining sites. (See also W79-01478) (Lynch-Wisconsin)
W79-01484

POPULATION GROWTH AND SOCIO-ECONOMIC BALANCE: HOW TO VISUALIZE ALTERNATIVE FUTURES,
Colorado Univ., Boulder. Dept. of Sociology.
E. Boulding.
In: Conference Proceedings - A Critical Economic Balance - Water - Land - Energy - People, June 6-7, 1977, Colorado State University, Pingree Park Campus. p 56-63. 8 fig.

Descriptors: *Human population, *Human resources, *Alternative planning, *Future planning(Projected), *Rocky Mountain Region, *Forecasting, *Energy, *Natural resources, Delphi technique, Analytical techniques, Trend projections, Colorado, Coal mines, Coals, Community development, Agriculture, Employment.

Methods of visualizing future impact of energy development on human development are described, and population trends for the Rocky Mountain region are discussed. A slow-down energy development scenario is suggested, allowing for a generation-length time lag, which would provide fully for human development and human welfare. It emphasizes diversified development of a wider range of energy resources for the western region, offers an alternative to boom town/ghost town cycles, and responds to current changes in life style preferences away from dependence on high technology and toward less complex, more labor-intensive ways of life. The scenario embodies a possible pattern of energy development which might begin with an extensive increase in local farming where intensive energy development is planned and population increase will be rapid. By protecting agricultural and family garden land, coal companies could enhance rather than destroy the quality of a community, and mine productivity would be positively affected. A wider variety of energy sources should be utilized, including wind and other solar sources, and women should be included in the work force to minimize social disruption and maximize efficiency. Population statistics generally do not indicate alarming densities, though trend lines are now relatively steep. Colorado (and other states) should double in population by the year 2000. Average growth trends mask sudden growth in specific areas, which pose serious problems. (See also W79-01478) (Lynch-Wisconsin)
W79-01485

CRITIQUE OF THE CHALLENGES,
Yuma Soil Conservation District, AZ.
M. Mekelburg.
In: Conference Proceedings - A Critical Economic Balance - Water - Land - Energy - People, June 6-7, 1977, Colorado State University, Pingree Park Campus. p 64-66.

Descriptors: *Research priorities, *Economic development, *Regional development, *Goals, *Natural resources, Agriculture, Energy, Cost allocation, Colorado, Planning, Solar energy, Institutional constraints.

Several issues of importance in evaluating the economic balance between land, water, people, and energy are identified and discussed briefly. They include intergovernmental communication, regional planning, costs and spending priorities, agriculture, the need for development of solar energy, soil and water conservation, energy, food production, government responsibility, cost allocation, energy production from grain (such as gasohol), water rights. For the forseeable future, food production will outweigh all other issues, including energy. If agriculture is not responsive to water conservation needs, some regulations will be necessary. Colorado ranks high among states receiving federal funding for soil and water conservation, but is nearly at the bottom in achievement. Solar energy could be very effectively applied to agriculture, especially in grain elevators. (See also W79-01478) (Lynch-Wisconsin)
W79-01486

FRAGILE LANDS AND PEOPLE,
Colorado State Univ., Fort Collins. Dept. of Politi-

cal Science.
N. Wengert.
In: Conference Proceedings - A Critical Economic Balance - Water - Land - Energy - People, June 6-7, 1977, Colorado State University, Pingree Park Campus. p 67-72.

Descriptors: *Land use, *Land, *Planning, *Rocky Mountain Region, *Great Plains, *Environment, *Natural resources, Southwest U.S., Policy, Human resources, Colorado, Urbanization, Air pollution, Water pollution, Mountain forests, Lumbering, Ecology, Mining, Agriculture, Strip mines, Natural resources.

The fragility of the western natural environment requires specialized kinds of research and poses special problems for land use planning. Land in Colorado and much of the West is fragile both in its natural state and with use by people. In both cases fragility carries with it high risk, uncertainty, and slow recovery from natural or man-induced intrusions. In their natural state the plains were subject to buffalo overgrazing, drought, blowing dust, grasshoppers, prairie fires, and forest fires. Man's uses, such as for dry-land wheat production, probably has not generally increased the hazards, though mismanagement has contributed to deterioration and depletion of particular areas. Some land management practices have in fact minimized these hazards and improved resources; examples are water spreading on range land and fire suppression in forests and grasslands. Nevertheless, management affects ecology in often-overlooked ways, such as fire prevention's effect on species succession among trees. The critical factor in the area's natural fragility is lack of water, which hinders strip mine reclamation and high plains agriculture. Ghost towns resulting from mining occur because alternatives to mineral exploitation were not considered. National Forests in the Rocky Mountains will be de-emphasizing lumbering under new legislation. Air and water pollution in cities is qualified by environmental factors such as altitude and streamflow variations. (See also W79-01478) (Lynch-Wisconsin)
W79-01487

VIEWPOINT FROM THE CAPITAL MARKET,
Webber (Walter) and Associates, Boulder, CO.
W. Webber.
In: Conference Proceedings - A Critical Economic Balance - Water - Land - Energy - People, June 6-7, 1977, Colorado State University, Pingree Park Campus. p 73-76.

Descriptors: *Capital supply, *Economics, *Financing, *Regional development, *Electric power production, *Natural resources, Yampa Project, Capital, Loans, Colorado, Grants, Private capital market, Electric powerplants.

Increasing quantities of capital will become necessary in the future to accomodate the nation's energy development. This paper discusses capital availability in the private market and its use in cooperative ventures which bring together the public and private sectors of the economy. Private capital formation in the U.S. is currently very satisfactory, and is more than adequate to meet demand. The western states have produced very little institutionalized capital, and sources must generally be found outside this region. The capital market views the West as a region of great profit potential. Two large projects illustrate private capital in combination with funding from federal and local government: (1) the Yampa Project, a large $700 million coal-fired electric generating station at Craig, Colorado; and (2) a $1.4 billion electrical project involving two Rural Electrification Administration (REA) cooperatives, a South Dakota power district, the city of Lincoln, Nebraska, and an association of 65 cities in Minnesota, Iowa, and South Dakota. The Yampa Project will carry power to five states, and involve two REA cooperatives, an Arizona agriculture and irrigation district, four Colorado cities, and the U.S. Bureau of Reclamation. Funding is through the Bureau of Reclamation, REA loans and bonds for the cooperatives share, and bonds for the shares of the other participants. Funding for the second project is through the Federal Finance Bank, the Bank for Cooperatives, and municipal bond market. (See also W79-01478) (Lynch-Wisconsin)
W79-01488

COAL DEVELOPMENT AND RECLAMATION - PLANNING AND CONSERVATION,
Grace (W. R.) and Co., Dallas, TX. Mining Div.
C. Margolf.
In: Conference Proceedings - A Critical Economic Balance - Water - Land - Energy - People, June 6-7, 1977, Colorado State University, Pingree Park Campus. p 77-82.

Descriptors: *Coal mines, *Conservation, *Reclamation, *Permits, *Institutional constraints, *Environmental effects, *Natural resources, Coals, Colorado, Colowyo Coal Company, Oil shales, Planning, Economics, Lake DeSmet(WY), Wyoming, Regulation.

This paper recounts the frustrations of W. R. Grace Company's Colowyo Coal Company Project (near Craig, Colorado) in obtaining a mining permit, and comments generally on environmental planning and energy development. Colowyo applied to the U. S. Geological Survey for a permit in July 1974, which has still not been granted. The permit application process is very cumbersome and time-consuming at the federal level, and additional regulations are required at the state and local levels. Although the surface land is owned by the company, the coal is federal coal, and thus the permit is necessary. The mining industry in 200 years has disturbed just under six million acres, of which about two thirds has either been reclaimed by the company or healed by nature. By contrast, 300 million acres have been disturbed by agriculture, and 30 million for airport, railway, and highway right-of-ways. The author cites examples where man has purportedly improved upon nature, such as Lake DeSmet, Wyoming, which was naturally a chemical cesspool before a diversion ditch was built to bring water into the basin. It is stated that there is merit to the environmental ethic, and that a mining company can do more to improve the environment than what nature accomplished before the mine was begun. (See also W79-01478) (Lynch-Wisconsin)
W79-01489

CRITIQUE AND CHALLENGES,
Energy Research and Development Administration, San Francisco, CA. Consumer Affairs. CA. R. Vallera.
In: Conference Proceedings - A Critical Economic Balance - Water - Land - Energy - People, June 6-7, 1977, Colorado State University, Pingree Park Campus. p 83-86.

Descriptors: *Goals, *Research priorities, *Energy, *Economics, *Environment, *Institutional constraints, *Natural resources, Solar energy, Coals, Geothermal energy, Nuclear energy, Planning.

Environmental, economic, energy, and societal needs are interrelated and of equal importance. The nation must seek to create a public climate in which realistic environmental and economic alternatives can be debated, cooperation can be achieved, and mutual efforts can be directed to issue-solving. Nuclear energy and coal are available now, and must be used. There is a loan guarantee for geothermal energy, but not for solar energy development; both must be considered potential sources of energy, but not currently available ones. In such states as California, regulations and the inversion layer preclude use of coal, and make use of nuclear energy imperative. It is important that there be dialogue among bureaucrats at all levels of government, state, local and federal. Elitism must be avoided. Communication is likewise necessary between government and the constituency. (See also W79-01478) (Lynch-Wisconsin)
W79-01490

EFFECTS OF SELECTED CHANGES IN THE INSTITUTIONAL AND HUMAN ENVIRONMENT UPON OUTPUT PER UNIT OF INPUT,
Brookings Institution, Washington, DC.
E. F. Denison.
Brookings General Series Reprint 335, 1978. 22p, 15 tab. NSF 75-23131.

Descriptors: *Economic effects, *Input-output analysis, *Pollution abatement, *National income, *Safety factors, *Crime, Economics, Human resources, Environment, Regulation, Standards, Water pollution control, Air pollution, Mining, Automobiles, Costs, Institutional constraints, Legislation, Governments, Economic growth.

Effects on national income (or net national product) of three major cost factors are assessed: (1) new requirements to protect the physical environment against pollution, (2) increased requirements to protect the safety and health of employees, and (3) a rise in dishonesty and crime among employees, customers, and the public. The analysis focuses on the period from about 1967 to 1975. In 1975 output per unit of input in the nonresidentialbusiness sector of the economy was 1.8% smaller than it would have been if business had operated under 1967 conditions. Of that amount, 1.0% can be ascribed to pollution abatement, 0.4% to employee safety and health programs, and 0.4% to the increase in dishonesty and crime. Output shrank minimally in 1968-70, but rapidly in the 1970s. Output per unit of input fell 0.2% between 1972 and 1973, 0.4% between 1973 and 1974, and 0.5% between 1974 and 1975. A reduction of 0.5% in annual growth rate is nearly one-fourth of the total annual growth rate of output per unit of input 1948-69 (2.1%)., and almost one-fifth of the growth rate of output per person employed (2.6%). This article is not intended as a criticism of the wisdom of government programs, but as an analysis of growth and productivity. Many costs occasioned by the three factors do not reduce output per unit of input, and a major part of this study was separating out such costs. This paper is part of a broader study of th sources of economic growht, which will update a previous publication covering 1929-69. (Lynch-Wisconsin)
W79-01491

AN ECONOMIC EVALUATION OF CROP-LAND USE AS A CONTROL FOR SEDIMENT NONPOINT POLLUTION,
Iowa Agriculture and Home Economics Experiment Station, Ames.
For primary bibliographic entry see Field 5G.
W79-01498

MARKET INPUT/OUTPUT STUDIES. TASK I. VINYLIDENE CHLORIDE,
Auerbach Associates, Inc., Philadelphia, PA.
M. N. Neufeld, M. Sittenfield, M. J. Plotkin, K. F. Wolk, and R. E. Boyd.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 205, Price codes: A09 in paper copy, A01 in microfiche. Publication No. EPA-560/6-77-033, AAI 2378/2379-101-FR-1, October 1977. 171 p, 16 fig, 42 tab, 106 ref. EPA 68-01-1996.

Descriptors: *Input-output analysis, *Vinylidene chloride, *Pollutants, *Industrial production, *Polymers, *Water pollution sources, Air pollution, Carcinogens, Public health, Markets, Effluents, Saran, Polyvinyl chloride, Polyvinylidene chloride, Industries, Chemical industry, Monomers, Landfills, Sewage lagoons, Waste disposal, Industrial wastes, Vinyl chloride.

A detailed study of the production, consumption, and losses to the environment of vinylidene chloride (VDC) and its important derivatives and polymers was prompted by its structural similarities to vinyl chloride, which in the early 1970s was found to be carcinogenic at relatively low concentrations (20 ppm) for chronic exposures. The toxicology of VDC and polyvinylidene chloride (PVDC) and related impact on human health are outside the scope of this report. Topics covered are: (1) current manufacturing sites and processes for VDC,

(2) shipping and handling practices, (3) production markets, (4) environmental management during production, (5) consumption processes and sites, (6) environmental management of the monomer in consumption processes, and (7) consumption markets. Although structurally similar to vinyl chloride, VDC is shown to have significantly different physical and chemical properties. Of 135 million lbs of VDC monomer input to polymer production facilities in 1976, about 560,000 lbs were lost directly to the atmosphere and 7.8 million labs were lost in the form of solid or latex emulsion disposed of in sewerage ponds or landfills. Converting processes are notoriously wasteful, with 15-50% of input packaging materials normally lost to landfills or incinerators. The 26 million lbs thus wasted at the converting level are estimated to contain less than 200 lbs of VDC monomer (2.5 ppm). (Lynch-Wisconsin)
W79-01500

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

THE TENNESSEE VALLEY AUTHORITY'S TELLICO DAM PROJECT-COSTS, ALTERNATIVES, AND BENEFITS.
General Accounting Office, Washington, DC.
For primary bibliographic entry see Field 6B.
W79-01193

ANALYSIS OF ECONOMIC EFFECT OF ENVIRONMENTAL REGULATIONS ON INTEGRATED IRON AND STEEL INDUSTRY. VOLUME II,
Temple, Barker and Sloane Inc., Wellesley Hills, MA.
For primary bibliographic entry see Field 5G.
W79-01194

EQUITABLE RECOVERY OF INDUSTRIAL WASTE TREATMENT COSTS IN MUNICIPAL SYSTEMS, FEDERAL GUIDELINES.
Environmental Protection Agency, Washington, DC. Office of Air and Water Programs.
For primary bibliographic entry see Field 5D.
W79-01206

THE INDUSTRY'S ROLE IN ENERGY MANAGEMENT,
Peabody Coal Co., Denver, CO. Regional Counsel's Office.
For primary bibliographic entry see Field 6B.
W79-01484

VIEWPOINT FROM THE CAPITAL MARKET,
Webber (Walter) and Associates, Boulder, CO.
For primary bibliographic entry see Field 6B.
W79-01488

RESOURCE EXTRACTION AND RECYCLING WITH ENVIRONMENTAL COSTS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Economics.
For primary bibliographic entry see Field 6A.
W79-01492

COMPUTERIZED COSTING MODEL FOR INLAND WATERWAYS BARGE TRANSPORTATION,
Missouri Univ., Rolla.
For primary bibliographic entry see Field 6A.
W79-01493

RENEWABLE RESOURCE MANAGEMENT AND EXTINCTION,
British Columbia Univ., Vancouver. Dept. of Mathematics.
For primary bibliographic entry see Field 6A.
W79-01495

A NOTE ON THE USE OF TAXES TO CONTROL POLLUTION,
Southampton Univ. (England).
For primary bibliographic entry see Field 5G.
W79-01496

THE 'STANDARDS AND PRICE' APPROACH TO POLLUTION CONTROL: PROBLEMS OF ITERATION,
Newcastle-upon-Tyne Univ. (England).
For primary bibliographic entry see Field 5G.
W79-01497

THE RESPONSE OF FIRMS TO POLLUTION CHARGES,
Concordia Univ., Montreal (Quebec).
For primary bibliographic entry see Field 5G.
W79-01499

6D. Water Demand

THE MANAGEMENT OF GROUNDWATER SUPPLIES,
Ground Water Consultants Group, Edmonton (Alberta).
For primary bibliographic entry see Field 4B.
W79-01117

MANUAL OF INDIVIDUAL WATER SUPPLY SYSTEMS.
Environmental Protection Agency, Washington, DC. Office of Water Programs.
For primary bibliographic entry see Field 5F.
W79-01311

A PILOT STUDY OF DRINKING WATER SYSTEMS ON AND ALONG THE NATIONAL SYSTEM OF INTERSTATE AND DEFENSE HIGHWAYS.
Environmental Protection Agency, Washington, DC. Office of Drinking Water.
For primary bibliographic entry see Field 5F.
W79-01312

ANALYSIS OF WATER FLOW PROBLEMS IN THE HELLS CANYON OF THE SNAKE RIVER,
Idaho Univ., Moscow. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W79-01359

WATER RESOURCES OF THE UPPER HENRYS FORK BASIN IN EASTERN IDAHO.
Geological Survey, Boise, ID. Water Resources Div.
R. L. Whitehead.
Idaho Department Water Resources(Boise), Water Information Bulletin No 46, May 1978. 91 p, 17 fig, 15 tab, 36 ref.

Descriptors: Water resources, *Surface waters, *Groundwater, *Water quality, *Water demand, Recration facilities, Water supply, Aquifer characteristics, Water yield, Water level fluctuations, Reservoirs, Lakes, Surface-groundwater relationships, *Rainfall-runoff relationships, Data collections, Evaluation, *Idaho, *Snake River Plain(Idaho), *Upper Henrys Fork basin(Idaho).

Upper Henrys Fork basin, Comprising 1, 070 square miles in eastern Idaho and a small area in western Wyoming, has a permanent population of about 1,500. Ashton is the major population center. Because the area attracts thousands of summer vacationers and winter sports enthusiasts, related land- and water-use pressures are increasing. Surface water is stored inHenrys Lake and island park Reservoir for irrigation outside the basin. Ground water is used chiefly for municipal, domestic, and stock supplies. Volcanic rocks and alluvium compose most of the aquifer materials. permeable volcanic rocks in the eastern part of te basin greatly influence water yields and ground-water movement between subbasins. Data suggest that movement across the basin boundary is minimal . Mean annual precipitation on the basin is estimated to be about 35 inches, of which about 50 percent contributes to the mean annual discharge in Henrys Fork near Ashton, which is 1,441 cubic feet per second, or about 18 inches. This represents the discharge form the basin, except for that lost to evapotranspiration. Annual mean discharge of streams generally varies directly with the annual mean precipitation. Water quality in the basin is generally excellent. Although, in the Ashton area and in areas of intermittent high usage by man, some deterioration of the quality is evident. Values for specific conductance range from less than 100 to about 300 micromhos per centimeter at25 C, except in the Ahston area where as much as 800 micromhos was measured in the ground water. (Woodard-USGS)
W79-01364

WATER-QUALITY INDICES FOR SPECIFIC WATER USES,
Geological Survey, Oklahoma City, OK. Water Resources Div.
For primary bibliographic entry see Field 5G.
W79-01381

COORDINATED ENERGY MANAGEMENT,
Federal Energy Administration, Lakewood, CO. Socioeconomic Program and Data Collection Office.
For primary bibliographic entry see Field 6B.
W79-01479

WATER -- DEMAND AND SUPPLY: ECONOMIC IMPACTS,
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
For primary bibliographic entry see Field 6B.
W79-01482

POPULATION GROWTH AND SOCIO-ECONOMIC BALANCE: HOW TO VISUALIZE ALTERNATIVE FUTURES,
Colorado Univ., Boulder. Dept. of Sociology.
For primary bibliographic entry see Field 6B.
W79-01485

6E. Water Law and Institutions

THE ORDINARY HIGH WATER MARK: ATTEMPTS AT SETTLING AN UNSETTLED BOUNDARY LINE,
Spessard L. Holland Law Center, Gainesville, FL.
F. E. Maloney.
Land and Water Law Review, Vol. XIII, No. 2, p 1-35, 1978. 208 ref. OWRT B-030-FLA(1), 14-34-0001-7113.

Descriptors: *Water resources development, *Legislation, *Judicial decisions, *Planning, *Legal aspects, *Water pollution, Flood plain zoning, Riparian rights, Permits, Administration, Prior appropriation, Civil law, Regulation, Boundaries, Public rights.

The ordinary high water line is typically defined as the boundary between privately-owned riparian uplands and publicly-owned lands beneath nontidal navigable waters. Considered are the definition of the ordinary high water line, the question of whether federal common law controls the definition of the line, the use of the meander line as an alternative boundary, the necessity of an ambulatory line, and the question of whether a definition based on statistical averaging would be legally valid. (Morgan-Florida)
W79-01009

REGIONAL GROUND-WATER MANAGEMENT,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W79-01105

GROUNDWATER LAW: MORE QUESTIONS THAN ANSWERS,
W. Wieking.
Pacific Groundwater Digest, Vol. 1, No. 1, p 35-36, September, 1978. Reprinted from Western Water-July/August Issue.

Descriptors: *Water law, *Water rights, *Ground water, *California, Prior appropriation, Riparian rights, Beneficial use, Reasonable use, Wildlife conservation, Water utilization.

The Governor's Commission to Review California Water Rights Law will soon release recommendations for changes in ground water rights laws. The present law is the result of a number of important court cases. There is no comprehensive set of ground water laws. A landowner is allowed to use as much water as he wants if it is beneficial. This results in overuse and danger of ground water each year or 2.2 million acre-feet more than the annual recharge rate. The usable ground water storage capacity is approximately 143 million acre-feet. The uncertainty involved in determining the amount of groundwater in storage and the rate of recharge is an obstacle in many court cases. This could be overcome by having local or state agencies conduct detailed hydrogeologic studies and keep up-to-date records. Some feel that appropriative rights prevent the equitable distribution of water and promote overuse of water. Conservationists are concerned that current water rights law does not adequately consider the water needs of fish and wildlife. While many water authorities advocate change, others argue that tampering with the system will create more problems than it will solve. (Purdin-NWWA)
W79-01118

RIPARIAN RIGHTS UNDER THE TEXAS WATER RIGHTS ADJUDICATION ACT - A CONSTITUTION ANALYSIS,
S. L. Golden.
Saint Mary's Law Journal, Vol 9, No 1, p 87-101, 1977.

Descriptors: *Riparian rights, *Constitutional law, *Natural resources, *Beneficial use, *Texas, Riparian water, Legislation, Water rights, Conservation, Properties, Appropriation, Eminent domain, Reasonable use, Legal aspects, Prior appropriation, Domestic water, Public rights, Usufructuary rights, Compensation.

In 1967, the Texas Water Rights Adjudication Act was passed pursuant to constitutional mandate that the legislature enact laws for the development, control, preservation, and conservation of the state's natural resources. The parts of the Act affecting riparian rights are examined in this article with emphasis placed on whether or not those provisions result in unconstitutional expropriations of real property. The Act provides for limitation of the riparian owner's rights by recognizing those rights only to the extent that they are applied to beneficial use, thus abrogating prior vested riparian rights to all reasonable uses of the water. The Legislature claims the Act is within the police power of the state. Others contend that riparian rights are vested property rights which are constitutionally protected from expropriation without compensation. The article examines similar acts passed by several other western states. Several of these acts have been held constitutional while others have been found to be unconstitutional. The author concludes that because riparian rights in Texas have long been recognized as a property right in the nature of a right in the land itself, the Act is unconstitutional in permitting expropriation, as opposed to appropriation, of vested property rights. (Spector-Florida)
W79-01140

THE FOX IN THE CHICKEN COOP: THE REGULATORY PROGRAM OF THE U.S. ARMY CORPS OF ENGINEERS,
Maryland Univ., Baltimore. School of Law.
G. Power.
Virginia Law Review, Vol 63, No 4, p 503-59, 1977.

Descriptors: *Regulation, *Administrative agencies, *Federal government, *Navigable waters, Governments, Legislation, Permits, Water policy, Institutions, Administrative costs, Administrative decisions, Decision making, Institutional constraints, Governmental interrelations, Political aspects, Rivers and Harbors Act, Judicial decisions, Law enforcement, Federal Water Pollution Control Act, Federal jurisdiction.

In recent years, the Army Corps of Engineers (Corps) has had an expanding role in the regulation of navigable waterways. This expanding role has changed the Corps from a permissive overseer of private activities to a defender of the environment. The Corps first gained regulatory powers via the Rivers and Harbors Act of 1899. This gave the Secretary of War (later Army) the power to license all dredging and filling activities. Discharge of refuse into waters was also prohibited without a permit from the Corps. Changing judicial and administrative interpretation of the Act has resulted in it being more literally and stringently enforced today than in the past. The Corps' territorial jurisdiction has been expanded by court decisions which interpret the term 'navigable waters' in the Federal Water Pollution Control Act to include all waters of the United States. As a result of these changes and institutional constraints, the Corps' program today does not work in the public interest as a moderator of coastal development. Current permit procedures are better designed to veto projects than expedite them. The program is in need of Congressional reform because it discourages development, beneficial or not. (Malefatto-Florida)
W79-01141

THE LEGALIZATION OF GROUNDWATER SHORTAGE,
Southern California Metropolitan Water District, Los Angeles.
V. E. Gleason.
Water Resources Bulletin, Vol 14, No 3, June 1978, p 532-41.

Descriptors: *California, *Underground storage, *Aquifer management, *Water rights, Judicial decisions, Water storage, Administrative agencies, Taxes, Overlying proprietor, Groundwater resources, Future planning(Projected), Competing uses.

Courts are only now starting to discuss and create an explicit groundwater storage right. Communities have traditionally relied on aquifer storage programs. Recently, however, these programs have become large, sophisticated, and expensive--thus fostering increased judicial concern. Established aquifer storage programs, operating under specific legal authority, have dealt with protection of groundwater rights, not with storage rights. The forms taken have been local agency acts tailored to fit unique situations of areas overlying each aquifer, and judicial regulation under a water rights adjudication. The storing agencies usually do not extract water themselves. All operations would be financed by imposing ad valorem taxes and, in some cases, 'pump taxes'. Legal ambiguities are involved in the aquifer storage concept. Two such ambiguities involve the relationship between aquifer storage and conventional property interests. The first interest is that of the overlying landowner, the second is the water rights owner's interest in using the groundwater within the aquifer. Many reasons exist for extending California's judicial recognition of aquifer storage rights to other states. Increasing pressures to use natural resources efficiently should be particularly persuasive. (Spiegel-Florida)
W79-01142

INDIANS AND THE ENVIRONMENT: AN EXAMINATION OF JURISDICTIONAL ISSUES RELATIVE TO ENVIRONMENTAL MANAGEMENT,
George Washington Univ., Washington, DC. National Law Center.
F. Schnidman.
Columbia Journal of Environmental Law, Vol 4, No 1, p 1-34, Fall, 1977.

Descriptors: *Indian reservation, *Jurisdiction, *Resource development, *Water rights, Environmental control, Federal government, State governments, Local governments, Land use, Water quality, Energy, Exploitation.

Jurisdiction over Indian lands in the United States has frequently been contested by states, the federal government and Indian tribes. The most pressing issues appear to be: (1) the extent of permissible Indian initiative to define, regulate and monitor resource management on Indian lands; (2) interplay between federal regulatory programs and state and tribal jurisdictional conflicts; and (3) the role of state police power over Indian lands. This article explores the historical aspects of the tribal, federal and state jurisdictional claims over Indians and their land. An examination of state administration of environmental management programs on Indian lands follows the first section. The final section is devoted to a proposal of an intergovernmental mechanism to deal with the use, protection, preservation and enhancement of the finite resources on Indian lands. The author concludes that existing federal policies favor Indian governmental and economic independence. In addition, bitter court fights have resulted in a deterioration of relations between states and Indians. Negotiation of Indian-state conflicts should be utilized when available. Also, states should seriously consider promotion of national policies favoring Indian self-determination and independence. (Quarles-Florida)
W79-01143

IN PURSUIT OF CLEAN OCEANS - A REVIEW OF THE MARINE PROTECTION, RESEARCH, AND SANCTUARIES ACT,
Naval Facility Engineering Command, San Bruno, CA. Western Div.
For primary bibliographic entry see Field 5G.
W79-01144

BUILDING PUBLIC/PRIVATE COOPERATION IN THE COASTAL ZONE,
Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
J. T. Kildow, D. Kramer, L. Newhouse, and K. Barrington.
Single copies of this article available from NTIS-JACS. Massachusetts, *Coastal engineering, *Industries, *Comprehensive planning, Coastal plains, Coastal marshes, Coastal structures, Energy, Legislation, Wetlands, Analysis, Future planning(Projected).

It is assumed that cooperation between private industry and the public sector is necessary for an effective coastal zone management plan in Massachusetts. This will allow planners and managers to develop a plan responsive to public environmental concerns and also sensitive to industry's needs. This research is designed to test the validity of this assumption, and also to inquire into the interests, characteristics, goals, needs and behavior patterns of private businesses as they interact with state agencies on environmental issues--particularly those relating to the coastal zone. Patterns for communication between public agencies and private businesses are identified with recommendations for incorporating them into a coastal zone program. The research focuses on outcomes of private-public interaction. Indications of the value of the various types of interaction are implicit in the study. The report consists of: (1) examinations of the Coastal Zone Management Act, of the activities of the Massachusetts Office of Coastal Zone Management, and federal constraints upon those activities; (2) case studies; (3) analysis of the assumptions of the study; and (4) conclusions about private-public interaction and their application to Massachusetts Office of Coastal Zone Management activities. (Quarles-Florida)
W79-01145

POLICY IMPLICATIONS OF URBAN LAND PRACTICES FOR GROUNDWATER QUALITY,
American Inst. of Planners, Washington, DC.
For primary bibliographic entry see Field 5G.
W79-01146

PROPOSED (GUIDELINE MODEL) COASTAL AND RIVERINE FLOOD PLAIN ZONING ORDINANCE,
Virginia State Water Control Board, Richmond.
For primary bibliographic entry see Field 6F.
W79-01147

VESTED RIGHTS TO DEVELOP LAND: CALIFORNIA'S AVCO DECISION AND LEGISLATIVE RESPONSES,
For primary bibliographic entry see Field 6F.
W79-01148

A CONSTITUTION FOR THE OCEANS: COMMENTS AND SUGGESTIONS REGARDING PART XI OF THE INFORMAL COMPOSITE NEGOTIATING TEXT,
Center for the Study of Democratic Institutions, Santa Barbara, CA.
E. M. Borghese.
San Diego Law Review, Vol 15, No 3, p 371-408, 1978. Appendix.

Descriptors: *Law of the sea, *United Nations, *Conferences, *Negotiations, Oceans, Exploitation, Technology, Research and development, Economics, Treaties, Evaluation, Ownership of beds.

The Informal Composite Negotiating Text is the result of the Sixth Session of the United Nation Conference on the Law of the Sea. This article critically examines the provisions of Part 11 of the Text. The author explores the relationship between the Law of the Sea and efforts of developing nations to restructure the world political and economic system. There is a detailed critique of the present negotiating text draft. Suggestions are made for reforming the draft to accommodate the quest of developing countries for a new world economic order. The author suggests that the Law of the Sea will continue its development in the context of the emergence of a new international order. The Text is a unique document which the international community is not accustomed to dealing with. Whatever the document's imperfections are, its adoption is not yet complete. Additional changes may be made before its final approval, if that point is ever reached. The article includes an appendix with an individual comparison of each subject in each of the three different texts on the Regime for the Deep Seabed considered at the Conference. (Quarles-Florida)
W79-01149

FEDERAL COMMON LAW AND OCEAN POLLUTION: A PRIVATE REMEDY FOR OIL POLLUTION DAMAGE,
For primary bibliographic entry see Field 5G.
W79-01150

PROBLEMS IN ATTEMPTING TO TRANSLATE STATUTORY STANDARDS INTO EMISSION LIMITATIONS UNDER AIR AND WATER POLLUTION CONTROL LEGISLATION,
Yeshiva Univ., New York. School of Law.
For primary bibliographic entry see Field 5G.
W79-01151

COASTAL PLANNING: THE DESIGNATION AND MANAGEMENT OF AREAS OF CRITICAL ENVIRONMENTAL CONCERN,
North Carolina Univ. at Chapel Hill. School of Law.
For primary bibliographic entry see Field 5G.
W79-01152

PUBLIC INVOLVEMENT IN NATURAL RESOURCE DEVELOPMENT: A REVIEW OF WATER RESOURCE PLANNING,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Div. of Environmental and Urban Systems.
For primary bibliographic entry see Field 6B.
W79-01153

UNDERGROUND INJECTION PROGRAM SET UNDER SAFE DRINKING WATER ACT,
New Mexico State Univ., University Park. School of Engineering.
For primary bibliographic entry see Field 5G.
W79-01154

NATIONAL WATER COMMISSION VIEWS GROUNDWATER PROTECTION,
For primary bibliographic entry see Field 5G.
W79-01155

STATE APPROACH TO GROUNDWATER QUALITY PROTECTION: THE ILLINOIS EXPERIENCE,
Illinois Environmental Protection Agency, Springfield. Div. of Land Pollution Control.
For primary bibliographic entry see Field 5G.
W79-01156

SHOULD THE LAW OF THE SEA CONFERENCE BE SAVED,
National Security Council, Washington, DC. Public Advisory Committee on the Law of the Sea.
M. L. Dickey.
International Lawyer, Vol 12, No 1, p 1-19, Winter, 1978.

Descriptors: *United Nations, *Oceans, *Conferences, *Negotiations, International waters, Mining, Treaties, Fisheries, Exploration, Natural resources, Ownership of beds.

The sixth session of the United Nations' Law of the Sea Conference recently came to a close. The results of the latest session were inconclusive at best. Another session is scheduled for Spring, 1977. Another result is an 'Informal Composite Negotiating Text' which is a revision of two previous drafts of 303 article on ocean issues. These issues include: ocean floor mining, pollution control, passage through straits, and new jurisdictional claims. The current session failed to make any significant breakthrough in major areas of disagreement. This article explores the realistic possibility of the conference ultimately succeeding. Some critics claim that a treaty agreed upon by the majority could be far worse than no treaty at all. Others insist the absence of a treaty would lead to a mad territorial scramble. The United States representative called the result of the latest session so fundamentally unacceptable on the issue of seabed mining as to require him to recommend a review of United States' interests in the continued negotiations. The author concludes that no acceptable treaty will be adopted unless one is formulated at the next session. (Quarles-Florida)
W79-01157

SEABED RESOURCES AND INTERNATIONAL LAW,
International Inst. for Environment and Development, Washington, DC.
R. Stein, and I. Walter.
Resources Policy, Vol 3, No 4, p 237-42, 1977.

Descriptors: *Law of the sea, *Resource allocation, *Oceans, *Exploitation, United nations, Technology, Jurisdiction, Mineral industry, Oil, International law, Resources development, Ownership of beds.

World population growth, along with advanced technology and dwindling resources, has raised the prospective value of the sea as an economic resource. This article explores the problems related to the exploitation and allocation of undersea resources. The nature and accessibility of undersea petroleum supplies and metalliferous nodules are described in terms of the existing and prospective future economic constraints. Ownership of these resources has recently generated international conflict since most resources lie outside national jurisdiction. The character of the conflict is explained, and the prospective solution under international law are identified. The most probable solution appears to be unilateral action on the part of countries possessing the requisite technology to exploit these resources. However, this solution may not satisfy many aspects of international equity. Undersea minerals recovery is predicted to dominate the future economics of international resources. The United Nations Conference on the Law of the Sea has so far failed to adopt any major resolution on these issues. If the Conference does not succeed, it is probable that intergovernmental agreements will arise among technically advanced countries. Developing countries can only hope for some minimal agreement to emerge from the Conference. (Quarles-Florida)
W79-01158

THERMAL DISCHARGES AND POWER PLANT INTAKES: SECTION 316 IN PERSPECTIVE,
For primary bibliographic entry see Field 5G.
W79-01159

GUIDELINES FOR MANDATORY EROSION CONTROL PROGRAMS,
Wisconsin Univ.-Madison.
For primary bibliographic entry see Field 5G.
W79-01160

UP TO OUR WASTES IN WET SUITS: THE FEDERAL LAW ON WATER POLLUTION,
For primary bibliographic entry see Field 5G.
W79-01161

A COMPARISON OF BETHLEHEM STEEL CORP V. TRAIN WITH REPUBLIC STEEL CORP. V. TRAIN: THE SIXTH CIRCUIT,
For primary bibliographic entry see Field 5G.
W79-01162

IN SEARCH OF COMMON NODULES AT UNCLOS III,
Virginia Univ., Charlottesville. School of Law.
J. N. Moore.
Virginia Journal of International Law, Vol 18, No 1, p 1-15, Fall, 1977. 1 tab.

Descriptors: *Oceans, *United Nations, *Exploitation, *Ownership of beds, Mining, Treaties, International waters, Law of the sea, Navigation, Resources development, Natural resources, Beds under water.

For more than two years, the Third United Nations Conference on the Law of the Sea (UNCLOS 3) has been achieving notoriety. The issue given so much attention is the legal order for deep seabed mining. It cannot be predicted when seabeds will be tamed. However, when the time arrives, it will enhance utilization of ocean resources, protection of shared interests in navigational freedom, improved protection for the ocean environment, and reduction in political tensions. It may even lay the groundwork for a successful North-South detente. Participants in UNCLOS 3 should recognize their achievements, yet realistically understand the difficulty they face in concluding a comprehensive law of the sea agreement. Focus should be placed on the deep seabed impasse, while unresolved non-seabed issues cannot be neglected. A 'unitary joint-venture' system between developing and developed countries may cause substantial problems. Not only will developed nations be able to dominate the Enterprise under any plan acceptable to them, but the system in general would be very rigid and restrictive. A 'balanced development system', with separate benefits for both developed and developing nations, would be more successful and more equitable. (Spiegel-Florida)
W79-01163

SOIL EROSION CONTROL POLICIES - INSTITUTIONAL ALTERNATIVES AND COSTS,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W79-01164

PRINCIPLES FOR WATER QUALITY MANAGEMENT,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5G.
W79-01165

TAP WATER AND TIMBER - THE COSTS OF MULTIPLE USE,
For primary bibliographic entry see Field 5G.
W79-01166

ENERGY AND THE COLORADO RIVER,
Utah State Univ., Logan. Dept. of Economics.
For primary bibliographic entry see Field 3E.
W79-01167

WATER RESOURCES AND OTHER RELATED LAWS OF ILLINOIS.
Illinois State Dept. of Transportation, Springfield. 1978. 216 p.

Descriptors: *Illinois, *Legislation, *Water resources, *Regulation, Surface waters, Administrative agencies, Drainage, Canals, Channels, Rivers, Lakes, Recreation.

There has been an increased public interest in the use of the rivers, lakes and streams of Illinois. Included in this graving concern have been numerous requests for information regarding statutes pertaining to this subject. Due to this increased awareness, the Illinois Department of Transportation (DOT), published a list of statutes dealing with rivers, lakes, and streams. Those statutes pertinent to the DOT's authority, duties, and jurisdiction, as well as to the authority of the DOT's Division of Water Resources, are included. Statutes have been placed under 17 headings, including plats, parks, nuisances, state government, counties, and local government. The two areas receiving the most coverage are 'canals and waterways' and 'drainage'. The statutes are listed by number and situated next to their respective titles. Each statute is copied verbatim from the Illinois Revised Statutes, 1977 State Bar Association Edition. No commentary is included. Reference to decisions of the Illinois Supreme Court and Appellate Courts construing any of these laws may be found by examining the Smith-Hurd Illinois Statutes under the chapters and sections cited herein. (Spiegel-Florida)
W79-01168

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1977 (PART 6, NEW ORLEANS, LA.).
Hearing, Subcomm. on Environmental Pollution, Comm. on Environment and Public Works, U.S. Senate, June 27, 1977, Serial No. 95-H25, 446 p.

Descriptors: *Federal government, *Federal Water Pollution Control Act, *Water pollution, *Evaluation, Legislation, Permits, Regulations, Toxins, Wetlands, Water pollution control, Political aspects, Water policy.

The subcommittee on Environmental Pollution, under the auspices of the United States Senate's Committee on Environment and Public Works, held a series of hearings in June, 1977. The subject of the hearings was the 1977 Federal Water Pollution Control Act Amendments. Subcommittee chairperson was Sen. Edmund Muskie, from Maine. In Sen. John Culver's opening address, he admonished mankind for its failure to preserve the natural resources which provide the necessities of life. Stressing the critical need to protect this nation's water, he described how Congress passed the 1972 Federal Water Pollution Control Act Amendments. George Anderson, of the Brunswick Pulp Land Company, addressed the subcommittee on possible legislative effects on the forest products industry. Anderson contended that section 404 was a case of over-kill in its methods of providing protection for wetlands. B. L. Deberry, Director of Texas' Department of Highways and Public Transportation, urged the repeal of legislation requiring permits for dredge and fill operations for highway and transportation facility construction. Many witnesses were called to discuss the discharge of toxic pollutants and the provisions of the Clean Water Act which protects wetlands. All witness testimony is provided. (Spiegel-Florida)
W79-01169

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1977 (PART 7, BURLINGTON, VT.).
Hearing, Subcomm. on Environmental Pollution, Comm. on Environment and Public Works, U.S. Senate, July 9, 1977, Serial No 95-H25, 226 p.

Descriptors: *Vermont, *Waste water treatment, *Federal water pollution control act, Alternative planning, Legislation, Local government, Sewage treatment, Recharge ponds, Groundwater recharge, Water quality standards, Evaluation.

The Subcommittee on Environmental Pollution is a sub-group of the United States Senate's Environment and Public Works Committee. A hearing was held to discuss amendments to the Federal Water Pollution Control Act (FWPCA). The issues discussed by the witnesses related to problems small rural communities face in complying with FWPCA waste treatment standards and alternatives to conventional secondary treatment plants. Basically, the conventional plants are too expensive for small communities. An example of alternatives is found in the testimony of Michele Frome, from the Vermont Natural Resources Council, who testified that on-site septic systems are a viable, permanent solution for small communities. Another witness discusses problems with household/on-site facilities and proposed methods to lower the cost of municipal wastewater treatment systems. Other witnesses included representatives of the Vermont Department of Highways and the state's Agency of Environmental Concern. There were numerous other witnesses. The Brookhaven National Laboratory submitted a detailed report on an experimental Marsh/Pond sewage recharge system, the purpose of which is to develop a natural system to continuously renovate sewage to groundwater rechargeable quality. All witness testimony is included in original form. (Horwich-Florida)
W79-01170

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1977 (PART 9, WASHINGTON, D.C.).
Hearings, Subcomm. on Environmental Pollution, Committee on Environment and Public Works, U.S. Senate, June 28, 29, 30 and July 1, 1977, Serial No 95-H25, 725 p.

Descriptors: *Federal water pollution control act, *Water pollution control, *Evaluation analysis, Federal government, Administrative agencies, Water pollution treatment, Water law, Environmental control, Industrial water, Comprehensive planning, Water quality standards.

Hearings before the Subcommittee on Environmental Pollution of the Senate Committee on Environment and Public Works continue in Washington, D.C. The purpose of these hearings is to consider what changes, if any, are necessary in the 1972 Federal Water Pollution Control Act Amendments (Act). The text includes the testimony of many witnesses offering their opinions on this matter. The witnesses include representatives of environmental groups as well as spokesmen for various industrial and developmental interests. A spokesman for the Edison Electric Institute expressed concern that all future increments of progress should be carefully examined to make sure that benefits received are worth the cost to the American consumer. The Natural Resources Defense Council's spokeman felt that additional staff and enforcement authority are necessary for the federal Environmental Protection Agency to meet its reponsibilities under the Act. The representative of the American Iron and Steel Institute appeared before the committee to ask for more time to meet the ambitious standards set by the Act. The spokesman for the Project on Clean Water urged that virtually no changes be made in the Act. (Quarles-Florida)
W79-01171

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1977 (APPENDIX, STATEMENTS SUBMITTED FOR THE RECORD).
Hearings, Subcomm. on Environmental Pollution, Committee on Environmental and Public Works, U.S. Senate, Part 10, Serial No 95-H25, 1977, 952 p.

Descriptors: *Federal water pollution control act, *Legislation, *Federal government, Regulation, Water pollution, Pollution abatement, Water quality, Public utilities, Environment, Water policy.

The subcommittee on Environmental Pollution is a sub-group of the United States Senate's Committee on Environment and Public Works. Hearings were held before the subcommittee to discuss Federal Water Pollution Control Act Amendments (FWPCA) of 1977. Senator Edmund Muskie, of Maine, was chairperson for the subcommittee. In this appendix lies statements made by witnesses who appeared before the subcommittee. All statements were submitted for and made a part of the record. Among those submitting statements were the Resident Commissioner from Puerto Rico, spokesman for the Water Pollution Control Federation, the Scott Paper Company, the American Farm Bureau Federation, and numerous other organizations. Topics discussed covered a broad spectrum although the basis of each statement were the FWPCA amendments. Unintended consequences resulting from the amendments were described by the president of the Puerto Rico Manufacturers' Association. The Canners League of California gave testimony as to why certain laws should not be applied to members of their industry. The National Association of Realtors urged prohibition of controlling growth through a sewage treatment construction grant program. Many other groups testified, on diverse subjects. All are included in this appendix. (Spiegel-Florida)
W79-01172

OIL POLLUTION LIABILITY.
Hearings, Subcomm. on Coast Guard and Navigation, Comm. on Merchant Marine and Fisheries, U.S. House of Reps., February 24 and 25, March 10 and 23, 1977, Serial No 95-2, 217 p.

Descriptors: *Legislation, *Oil spills, *Federal government, *Evaluation, Oil pollution, Regulation, Navigation, Fisheries, Water pollution, Disasters, Compensation.

In February, 1977, hearings were held before the Subcommittee on Coast Guard and Navigation, under the direction of the United States House of Representatives Committee on Merchant Marine and Fisheries. The topic discussed at the hearings was oil pollution liability. More specifically, bills were discussed which had been formulated to provide a comprehensive system of liability and compensation for oilspill damage and removal costs. Mario Biaggi, Representative from New York was chairperson. In his opening remarks, Rep. Biaggi emphasized that the pending legislation was being considered against a background of numerous recent oilspill incidents. Rep. Biaggi claimed one such bill, H.R. 3711, was being formulated to accomplish three goals: to establish rights and liabilities of persons affected by, or involved in, an oil pollution incident; to provide an efficient recovery system for injured parties; and to eliminate conflicting laws so that compensation procedures would be centralized. Numerous witnesses, including representatives of insurance companies, the environmental community, and the American Trucking Association, were recognized to discuss this and other pieces of proposed legislation. All witness testimony is included. (Spiegel-Florida)
W79-01173

WATER CONTAMINATION BY TOXIC POLLUTANTS: AN ASSESSMENT OF REGULATION,
Library of Congress, Washington, DC. Div. of Environment and Natural Resources Policy.
J. E. Blodgett, C. A. Musgrove, and M. E. A. Reisch.
Prepared for the Subcommittee on Investigations and Review of the Committee on Public Works and Transportation, U.S. House of Representatives, Publication No 95-26, Sept 1977, 81 p.

Descriptors: *Toxins, *Water pollution control, *Regulation, *Water policy, Legislation, Administrative decisions, Federal water pollution control act, Water quality, Federal government, Evaluation, Analysis, Pollutants.

Waters are contaminated by basically two broad categories of pollutants. One is made up of degradable waste products, which natural systems can assimilate or degrade with proper management. The other category is composed of toxic pollutants, which present more complex pollution control problems. Included in the toxic category are such contaminants as heavy metals, pesticides, industrial chemicals such as PCB's, and carcinogenic chlorinated hydrocarbons. Several federal pollution control laws deal with toxic substances, including the Federal Water Pollution Control Act, the Marine Protection, Research and Sanctuaries Act, the Resource Conservation and Recovery Act, the Safe Drinking Water Act, and the Toxic Substances Control Act. How each of these statutes function with respect to toxics, as well as the major problems which have been encountered with their enforcement, is outlined in this assessment paper. Policy issues discussed include: the need for comprehensive pollution control; sufficiency of existing control strategies; party liability and compensation; and the fragmentation and coordination of administrative functions. The two basic questions raised in the paper's conclusion concern implementation of existing statutes and whether more legislation is needed to fill gaps in existing toxic substance control law. (Malefatto-Florida)
W79-01174

LITTLE RIVER, IOWA, WATERSHED PROJECT.
Hearings-Subcomm. on Water Resources, Comm. on Public Works and Transportation, U.S. House of Representatives, November 29, 1977, 8 pages. Publication No 95-41.

Descriptors: *Iowa, *Water resources development, *Water management(Applied), *Watershed management, Water supply development, Water utilization, Engineering structures, Flood protection, Flood control, Water control, Dams, Project planning.

The Little River, Iowa, watershed project of the Soil Conservation Service--a project for flood prevention, erosion control, and municipal water supply--was considered by the U.S. House of Representatives Subcommittee on Water Resources. Testimony of the Assistant Administrator of Water Resources, and representatives of the Soil Conservation Service and the U.S. Department of Agriculture, indicated that the proposed project would reduce runoff, erosion and sediment in the watershed, and greatly reduce the annual floodwater and gully erosion damage in the area. Additionally, Iowa Rep. Tom Harkin stated that the use of the main reservoir as a municipal and rural water supply source was underestimated and that ground water supplies in southern Iowa were of poor quality and limited quantity. Thus, the survival of small towns and the continued agricultural productivity of the area were dependent upon authorization of the project. In response to a request by the federal Environmental Protection Agency, the quality of water entering the reservoir would be monitored for one year before installation of a dam. If the water was of sufficiently poor quality, the water supply purpose could be deleted from the project. (Rule-Florida)
W79-01175

STATUS REPORT ON LAW OF THE SEA CONFERENCE.
Hearing, Subcomm. on Public Lands and Resources, Comm. on Energy and Natural Resources, U.S. Senate, July 26, 1977, 30 p, Publication No 95-62.

Descriptors: *United Nations, *Ownership of beds, *Law of the sea, *Conferences, International waters, Oceans, Surface waters, Mining, Exploration, Exploitation, Negotiations, Analysis.

The status report of the Sixth Session of the Third United Nations Law of the Sea Conference was presented to the Subcommittee on Public Lands and Resources, of the U.S. Senate's Committee on Energy and Natural Resources. Compromises resulting from negotiations during the Conference were significant to the United States, particularly regarding the legal status of the economic zone. The right of a coastal state to withhold its consent to marine scientific research was limited, as was a provision which would have allowed a coastal state to prevent publication of scientific research results. However, provisions completely unacceptable the United States were included in the seabed test. These provisions do not provide reasonable assurance of access to the deep seabed, and seem to give the Seabed Authority the power to regulate scientific research in the deep seabed. These provisions were so unacceptable as to make the entire treaty inadequate for the protection and advancement of United States' interests. The decision of whether it would be worthwhile to attempt further negotiations depends on how important the treaty is to the United States and whether a process could be found that offers an adequate basis for United States' participation in seabed mining. (Rule-Florida)
W79-01176

INCLUSION OF ALASKA LANDS IN NATIONAL PARK, FOREST, WILDLIFE REFUGE, AND WILD AND SCENIC RIVERS SYSTEMS (PART II, WASHINGTON, D.C.).
Hearings, Subcomm. on General Oversight and Alaska Lands, Comm. on Interior and Insular Affairs, U.S. House of Representatives, April 25 and 28, 1977, 383 p, Serial No 95-16.

Descriptors: *Alaska, *Legislation, *Federal government, *Conservation, Land use, National parks, Forests, Preservation, Wildlife conservation, Rivers, Internal water, Water resources development.

Hearings were held before the Subcommittee on General Oversight and Alaska Lands of the U.S. House of Representatives' Committee on Interior and Insular Affairs. The general topic discussed was the conclusion of Alaska lands in national park, forest, wildlife refuge, and wild and scenic rivers systems. The subcommittee was chaired by Rep. John Seiberling, from Ohio. Discussed were the following bills: H.R. 39, H.R. 1974, H.R. 2876, and H.R. 5505 et al. These proposed bills dealt with designating certain Alaskan lands as parts of the national wilderness preservation systems. H.R. 1454 was proposed to establish the Lake Clark National Park in the state of Alaska. The final bills discussed, H.R. 5605 and H.R. 8651 concerned establishing the Admiralty Island National Preserve in Alaska. Buff Bohlen, representing the federal Department of the Interior, was one witness. He urged adoption of the proposed legislation, noting that there was no conflict between the need for parks and the national need for energy and minerals. Bohlen also saw the proposed as being consistent with principles of sound land use management. Various other witnesses, including many conservationists, spoke at the hearings. All witness tesimony is provided. (Spiegel-Florida)
W79-01177

INCLUSION OF ALASKA LANDS IN NATL. PARK, FOREST, WILDLIFE REFUGE, AND WILD AND SCENIC RIVERS SYSTEMS (PART V, ATLANTA, GA.).
Hearings, Subcomm. on Gen. Oversight and Alaska Lands, Comm. on Interior and Insular Affairs, U.S. House of Rep., May 14, 1977, Serial No 95-16, 242 p.

Descriptors: *Alaska, *Legislation, *Federal government, *Conservation, Land use, National parks, Forests, Preservation, Wildlife conservation, Water resources development, Internal water, Rivers.

Hearings were held before the Subcommittee on General Oversight and Alaska Lands of the U.S. House of Representatives' Committee on Interior and Insular Affairs. The general topic discussed was the inclusion of Alaska lands in national park, forest, wildlife refuge, and wild and scenic rivers systems. The subcommittee was chaired by Rep. John Seiberling, from Ohio. Discussed were the following bills: H.R. 39, H.R. 1974, H.R. 2876, and H.R. 5505, et al. These proposed bills dealt with designating certain Alaskan lands as parts of the national wilderness preservation systems. H.R. 1454 was proposed to establish the Lake Clark National Park in the state of Alaska. The final bills discussed, H.R. 5605 and H.R. 8651 concerned establishing Admiralty Island National Preserve in Alaska. Statements were made by various witnesses at the hearings. Louise Franklin and Dr. Bob Pedigo both urged adoption of the legislation in order to preserve an entire ecosystem for future generations. Rep. Wyche Fowler, from Georgia, also encouraged speedy adoption of the legislation, as did many of the witnesses. All witness testimony is given. (Spiegel-Florida)
W79-01178

INCLUSION OF ALASKA LANDS IN NATL. PARK, FOREST WILDLIFE REFUGE AND WILD AND SCENIC RIVERS SYSTEMS (PART XII, FAIRBANKS, ALASKA).
Hearings, Subcomm on Gen. Oversight and Alaska Lands, Comm. on Interior and Insular Affairs, U.S. House of Reps., Aug. 20 1977, Serial No. 95-16, 577 p.

Descriptors: *Alaska , Legislation, *Federal government, *Conservation, Land use, National parks Forests, Preservation, Wildlife conservation, Water resources development, Internal water, Rivers.

Hearings were held before the subcommittee committee on General Oversight and Alaska Lands of the U.S. House of Representatives' Committee on Interior and Insular Affairs. The general topic dicussed was the inclusion of Alaska lands in national park, forest, wildlife refuge, and wild and scenic rivers systems. The subcommittee was chaired by Rep. John Seiberling, from Ohio. Discussed were the following bills: H. R. 39, H. R. 1974, H. R. 2876, andH. R. 5505 et al. These proposed bills deal with designating certain Alaskan lands as parts of the national wilderness preservation systems. H.R. 1954 was proposed to establish the Lake Clark National Park in the state of Alaska. The final bills discussed, concerned establishing Admiralty Island national Preserve in Alaska. Two witnesses, Jeff Kraebel and Rudolph Vetter, opposed passage of the legislation because of its potential effect on mining. Both felt that vital minerals would never be brought to the surface if they were buried beneath protected lands. The Governor of Alaska urged that title to the lands in question be given to tha Alaskan people. Many private citizens spoke at the hearings. Al witness testimony is provided. (Spiegel-Florida)
W79-01179

INCLUSION OF ALASKA LANDS IN NATIONAL PARK, FOREST, WILDLIFE REFUGE, AND WILD SCENIC RIVERS SYSTEMS (PART XIII, ALASKA TOWN MEETINGS),
Hearings, Subcomm. on General Oversight and Alaska Lands, Comm. on Interior and Insular Affairs, U.S. House of Reps., August 8-19, 1977, Serial No. 95-16, 665 p.

Descriptors: *Alaska, *Land classification, *Legislation, *Conservation, Fishing, Wildlife, Rivers, Wetlands, Water rights, Social impact, National parks, Internal water.

Hearings were held by the Subcommittee on General Oversignt and Alaska lands, of the U.S. House of Representatives' Interior and Insular Affaris Committee. John Seiberling presided. Discussed was the inclusion of Alaskan lands in national park, forest, wildlife refuge, and wild and scenic rivers systems. Several native Alaskans and representatives of the Association of Village Council Presidents (A.V.C.P.), among others, testified as to the possible effects of the proposed bill. Many indicated they would prefer wildlife refuge status because federal management proposes to be more favorable to their subsistence way of life than does the present state regulation system. For example, protection of hunting and fishing rights, with preferential treatment of subsistence hunters. Two A.V.C.P. complaints with the bill were: (1) that motor vehicles (snowmobiles, powerboats, airplanes), which have become an integral part of the subsistence way of life, should be permitted to be used; and (2) that no special protection against use by outsiders is offered for waters to be classified as 'wild and scenic rivers'. Morris Udall, Committee chairman, assured the A.V.C.P. representatives that the bill would be written in such a way as to protect subsistence lifestyles. All witness testimony is provided. (Horwich-Florida)
W79-01180

MEEKER V. CITY OF CLINTON (FLOOD DAMAGES CAUSED BY MUNICIPAL AND RAILROAD NEGLIGENCE),
259 N. W. 2d 822-33 (Iowa 1977).

Descriptors: *Iowa, *Flood damage, *Railroads, *Watersheds(Basins), Cities, Civil engineering, Damages, Bridges, Floods, Dams, Flood control, Judicial decisions, Sewers, Rain, Storm water, Urban drainage, Drainage systems, Ditches, Negligence.

Plaintiff homeowners brought suit against city and railroad to recover damages sustained in a flood which was allegedly caused by defendants' negligence in failing to remove debris from creek and ditch. Plaintiffs claimed that defendants allowed debris to build up in areas and around structures under their control. This debris was alleged to have acted as a dam thereby causing the flood. The defendant city denied that it had any duty to keep the creek in a proper condition. Both defendants contended that they did not breach any duty to keep the creek and ditch in good repair, and they further submitted that their negligence, if any, was not the proximate cause of plaintiffs injury. The Supreme Court of down held that in the absence of evidence that there was debris in the creek or ditch at the time of the flood or that debris caused the flood on the grounds that defendants negligently failed to remove debris from the creek or ditch. The only evidence presented showed that excessive rain caused the flood. (Jordan-Florida)
W79-01181

OAK LEAF COUNTRY CLUB, INC. V. WILSON (FLOOD DAMAGE CAUSED BY CHANNELIZATION),
257 N.W. 2d 739-48 (Iowa 1977).

Descriptors: *Iowa, *Channel improvement, *Flood damage, *Erosion, *Silting, Abrasion, Alteration of flow, Bank erosion, Accelerated erosion, Deposition(Sediment), Damages, Diversion, Drainage, Drainage effects, Sedimentation, Streamflow, Running waters, Topography, Floods.

Plaintiffs, owners of land located immediately below defendant's farm, alleged that defendat's straightening of the Black Hawk Creek altered it's natural course and accelerated the velocity of the current which caused increased scouring and abrasion to the creek banks as well as increased flooding. The action was alleged to have damage plaintiffs' land through deposits of sand, silt and extensive erosion, Defendant denied these allegations, and also raised as an affirmative defense plaintiffs' failure to mitigate damages by their failure to stabilize the banks of the creek. The trial court granted defendants' motion for directed verdict on the grounds that the evidence was insufficient to carry the issue of liability to a jury and plaintiff appealed. The Supreme Court of Iowa reversed and held that although plaintiffs were required to introduce evidence showing the after effects of floods were different subsequent to the channelization project, there was sufficient evidence introduced from which a jury could infer that defendant acted unreasonably in straightening the channel in such a way as to harm plaintiff. One must exercise ordinary care inthe use of his property so as not to injure the rights of neighboring landowners. (Jordan-Florida)
W79-01182

STATE WATERS-GENERAL PROVISIONS.
N.D. Cen. Code Ann. secs 61-01-03 thru -23 (1960), as amended (Supp. 1977); secs 61-01-24 thru -26 (Supp. 1977).

Descriptors: *North Dakota, *Legislation, *Water policy, *Water resources development, Water law, Permits, Regulation, State jurisdiction, Drainage programs, Legal aspects, Comprehensive planning, Management.

Chapter 61-01 of the North Dakot
W79-01183

MATTER OF THE WATERS OF LONG VALLEY CREEK SYSTEM (PROSPECTIVE RIPARIAN RIGHTS CANNOT BE DENIED OR QUANTIFIED BY STATE WATER RESOURCES BOARD),
148 Cal. Rptr. 488-93 (Ct. App. 1978).

Descriptors: *California, *Riparian rights, *Beneficial use, *Administrative decisions, Irrigation, Streams, Water rights, Water supply, Water users, Water utilization, Resource allocation, Constitutional law.

Nine claimants sought statutory adjudication of water rights by the State (California) Water Resources Control Board. Appellant, a private landowner, claimed prospective riparian rights for land he had not previously irrigated. The Board limited Appellant's rights to use for the land previously irrigated, because the area water supply was limited. The state Superior Court upheld the order. On appeal, the landowner argued that riparian rights are vested and cannot be lost or quantified because of non-use. Appellant also alternatively contended that prior litigation among the claimants was precluded by prior litigation. The court sustained these contentions and reversed the lower court decision, holding that a riaprian owner's water rights, unlike those of an appropriator's do not depend upon resent use. Further, state Water Code section 2769 was declared unconstitutional to the extent that it requires quantification of prospective riparian rights. However, the trial court may determine whether the proposed new use is a reasonable beneficial use and, if so, the quantity required and allocated for such use. (Horwich-Florida)
W79-01184

RIGHT TO CONSTRUCT DAMS AND RAISE WATER-CONDUCTING WATER OVER LANDS AND RAILROAD RIGHTS OF WAY,
Mont. Rev. Code sec 89-820 (1947).

Descriptors: *Montana, *Dam construction, *Right-of-way, *Railroads, *Beneficial use, Reservoir construction, Embankments, Water rights, Legal aspects, Compensation, Ditches, Conveyance structures, Flumes, Water conveyance, Legislation.

The right to conduct water from or over the land of another for any beneficial use includes several rights. The water may be raised by means of dams, reservoirs or embankments to make it useful for the intended purpose. The land necessary for this may be acquired upon payment of just compensation as provided by law for the taking of private property for a public use. If it is necessary to conduct water across the right of way of any railroad, the owners of the ditch or flume must give the owner of the railroad thirty days notice, in writing, or their intent to construct a ditch or flume across the right of way of such railroad, of its location and of the time of construction. If the owner of the railroad fails to appear and attend at the time and place fixed in this notice, the owner of the ditch or flume may lawfully contruct the ditch or flume without further notice. (Beamer-Florida)
W79-01185

RULES AND PROCEDURE FOR COASTAL CONSTRUCTION AND EXCAVATION.
Florida Dept. of Natural Resources, Tallahassee. Div. of Marine Resources.
Fla. Admin. Code, Ch 16B-25, secs 25.01 thru 25.09 (1978).

Descriptors: *Florida, *Coastal structures, *Evacuation, *Regulation, Natural resources, Legislation, Administrative agencies, Structures, Beaches, Dunes, Sea walls.

Florida Statutes, Section 161.052 and 161.053, are implemented by this rule of the Florida Department of Natural Resources (DNR). The rule established the requirements and procedures relating to: (1) coastal construction; (2) the processing of requests for variances and related conditions; and (3) other activities seaward of a setback line. There is also a general prohibition against: (1) removal of any beach material; (2) alteration of existing ground elevation; (3) driving any vehicle on any sand dune; or (4) damaging any sand dune or vegetation thereon. Certain exemptions are provided for minor, temporary excavations and certain repairs to existing structures. Any person wishing to obtain a variance from the DNR must submit an application to the Bureau of Beaches and Shores. The application must include, among other items: (1) a topogrphic survey; (2) description and reasons for the work; (3) name, address, and telephone number of the appicant;(84) ev 84) evidence of legal ownership of the land; and (5) assurance that no local setback ordinance will be violated by the proposed project. (Quarles-Florida)
W79-01186

BOND STREET AND WEATHERBEST SLIP BOATHOUSE OWNERS V. CITY OF NORTH TONAWANDA (CITY MAY NOT TERMINATE WATER SERVICE TO A CUSTOMER IN GOOD STANDING).
404 N.Y.S. 2d 463-64 (1978).

Descriptors: *Sewage disposal, *Adjudication procedure, *New York, *Municipal water, Water pollution sources, Water pollution control, Water policy, Pollution abatement, Water quality standard, Public health, Sewage treatment, Leases.

Appellant tenants of respondent city occupied boathouses on city owned riverfront property. Appellants connected city water service to the boathouses at their own expense. In 1973, the Niagra County Health Department determined that raw sewage was being discharged into public waterways from these boathouses, and ordered the city to abate the conditions. Attmpting to comply, the city changed its leases to forbid the use of boathouse property as temporary or permanent residences. Any violation of such condition would automatically terminate the lease. The pollution continued, and in 1976 the city terminated the water supply to the boathouses. Appellants brought this action to compel the city to supply water for as long as they paid the proper charges. The court held that the city could not terminate appellants' water supply because a consumer who has been provided with water and paid their taxes has an implied contract for continued service so long as the consumer pays their bills. Legal eviction proceedings or the installation of sewer systems were suggested as appropriate remedies by the court. (Stump-Florida)
W79-01187

METALLIC MINING RECLAMATION ACT,

Wisc. Stat. Anns. Secs 144.80 thru 144.94 (Supp 1977).

Descriptors: *Wisconsin, *Mining, *Reclamation, *Environmental control, Metals, Legislation, Mineral industry, Permits, Regulation, Standards, Water quality control.

The purpose of Wisconsin Metallic Mining Reclamation Act (Act) is to provide that the air, lands, waters, fish and wildlife affected by prospecting or mining in the state will receive the greatest practicable degree of protection and reclamation. A mine reclamation council serves as a problem solving body to work as a liaison between the department and the metallic mining industry. The department is to serve as the central unit of state government in carrying out the purpose of the Act. The department duties include: (1) the establishment of rules setting minimum qualifications for applicants for prospecting and mining permits; (2) the adoption of minimum standards for prospecting, mining, and reclamation; and (3) the development of a comprehensive program of mineral resources zoning and financial incentives. The procedure for obtaining mining prospecting permits is set forth. No one may engage in these activities without a permit. Posting of bond by the mining operator is required. Modifications of a permit may be allowed upon application. Sanctions and enforcement of the Act against noncomplying operators are provided. (Quarles-Florida)
W79-01188

CITY OF BERKELY V. SUPERIOR COURT FOR THE COUNTY OF ALAMEDA (ADDITIONAL ADJUDICATION ISSUES NEED TO DETERMINE IF LAND SUBJECT TO PUBLIC 'TIDELAND TRUST'),
147 Cal. Rptr. 113-25 (Ct. App. 1978).

Descriptors: *California, *Public lands, *Land resources, *Shores, State government, Ownership of beds, Tidal waters, Marshes, Bays, Public benefits, Navigation, Fishing.

A conflict arose regarding public versus private ownership of a tract of land located on the shoreline of the San Francisco Bay. The principle issue was whether the disputed tract was held subject to a 'tideland trust'. When California was admitted to the Union it assumed ownership of certain tidelands which it held in trust for public purposes of navigation, commerce, and fishing--thus the term 'tideland trust'. The city of Berkely and the state claimed the trust continued to exist while the Santa Fe Land Improvement Company claimed to own the land in question. Santa Fe argued that pursuant to two legislative acts, the land had been conveyed by the state 'free of the public trust for commerce, navigation and fishing'. On this issue, the court concluded that the titles conveyed to private parties were subject to the tideland trust. However, the court did not rule on all issues presented by the case. It decided that more facts were necessary and that only when all facts and issues had been distinguished could the case ultimately be resloved. Consequently, the issues were remanded to the trial court of complete adjudication there. (Spiegel-Florida)
W79-01189

HOLLISTER PARK INVESTMENT CO. V. GOLETA COUNTY WATER DISTRICT (NO DAMAGES TO LANDOWNER DENIED WATER DURING WATER SHORTAGE EMERGENCY),
147 Cal. Rptr. 91-93 (Ct. App. 1978).

Descriptors: *Water supply, *Water districts, *California, *Water rights, Legislation, Water allocation(Policy), Distribution, Water shortage, Water users, Competing uses, Damages, Land tenure.

Plaintiff landowner owned nearly 25 acres of property inside the Goleta County (California) Water District. Plaintff's land had not been developed when the district adopted a resolution declaring an emergency water shortage of 4,000 acre-feet per year. Because of this shortage, no new water service connections were approved pending evaluation and planning for supplemental water sources. Plaintiff, unable to secure a connection to the district's water service, was consequently unable to develop his land. Plaintff could not maintain financing for the property and it was eventually sold in forclosure sale. Plaintiff then filed a suit seeking damages in inverse condemnation, arguing that he had a constitutional right to a 'reasonable level' of utility service and that the ordinance in question represented a 'no growth' policy. The trial court held that as a potential user, plaintiff did not have an absolute right to the water, as did existing users. The court also decided that because a moratoruim on new services existed only during emergency situations and because the district was attempting to develop an expansion plan for water use, damage to the landowner was not compensable. (Spiege-Florida)
W79-01190

PHILADELPHIA CHEWING GUM CO. V. COMMONWEALTH OF PENNSYLVANIA, DEPT. OF ENVIRONMENTAL RESOURCES (LAND-OWNERS AND OCCUPIERS LIABLE FOR CORRECTION OF POLLUTING CONDITION).
387 A. 2d 142-53 (Pa. Commw. Ct. 1978).

Descriptors: *Pennsylvania, *Water quality control, *Land tenure, *Pollution abatement, Land use, Administrative agincy, Legislation, Water pollution sources, Groundwater, Costs, Remedies.

Petitioners, landowners and land occupiers, requested a review of a Pennsylvania Environmetal Hearing Board order. In deciding whether the state can direct a landowner or occupier to correct a water polluting condition on the land--a condition which was created by neither the landowner nor the occupier-the curt held that the Department could order the correction of such a polluting condition. However, such owner or occupier would be liable for the cost of correction only if he permitted or authorized the creation of the condition, or if he knows or should know of the existence of the condition and associates himself in some affirmative conduct indicating adoption of the polluting condition. Here, even though the polluting condition on the land may have been created before the enactment of a stature imposing liability on landowners and occupiers for correction of the condition, the statute was not 'ex post facto' legislation because it was the present land condition which was to be corrected. Also, because the parties here were not 'blameless', the state was not required to prove or show the feasability of the abatement corrections mandated. (Spiegel-Florida)
W79-01191

WARRIOR, INC. V. EASTERLY (DEVELOPER ASSESSED DAMAGES CAUSED BY EXCESS DRAINAGE WATER AND DEBRIS POLLUTING LANDOWNER'S POND,
360 So.2d 700-04 (Miss. 1978).

Descriptors: *Mississippi, *Drainage effects, *Damages, *Riparian rights, Ditches, Reasonable use, Discharge(Water), Surface waters, Channels, Water rights, Construction, Drainage water.

Plaintiff corporation sued adjacent landowners in a water drainage action. Plaintiff was building a subdivision of homes on property next to defendat's land. During this construction period, water flowed from a drainage ditch on plaintiff's land into a pond on defendant's property. The corporation accelerated the water flow into the pond by removing obstructions from the ditch. Defendant's pond filled with sand and trash. Defendant and plaintiff agreed the pond would be cleaned after completion of the subdivision. However, defendant then excavated the pond on his own. Plaintiff corporati on sued, alleging defendant's action had allowed the drainage water flow, causing it to back up onto the subdivision. Defendant landowners cross complained, seeking damages because of the water from the subdivision. The trial court enjoined the corporation from continuing its drainage activity. On appeal, the Mississippi Supreme Court held that while an upper riparian owner may reasonably drain surface waters into a water course, he cannot collect surface waters and discharge them in a concentrated flow upon adjoining owners. Although the injuction was dismissed, monetary damages were awarded to defendats in lieu of the injuction. (Spiegel-Florida)
W79-01192

LEGAL AND INSTITUTIONAL PLANNING FOR MACRO-CONSERVATION MEASURES,
Denver Univ., CO. Coll. of Law.
J. A. Carver, Jr.
Public Utilities Fortnightly, Vol. 95, No. 9, p 29-33. April 24, 1975. OWRT C-5205(No. 4210)(2), 14-31-0001-4210.

Descriptors: *Thermal powerplants, *Heatingm, *Energy, *Thermal energy, *Heat transmission, *Legal aspects, *Institutional constraints, Water policy, Administration, Administrative agencies, Economics, Planning, Political aspects, Organizations, Regulation, Utilities, Heated water, Electric power, Electric power industry.

Load patterns of electricity and heat do not match on a daily or seasonal basis. Storing large amounts of useful heat in underground aquifers is being studied and appears feasible. If overall system efficiency of a nuclear energy plant can be doubled by generating and delivering useful heat as well as electricity, the new resource for each thousand-megawatt plant would be at least 5 million barrels of oil per year. Electric-utility planning has been motivated more by a desire to reduce costs than to conserve resources. The deferred costs of oil and gas must now be paid. Research is needed to find a way to account for costs and benefits of energy conservation and pollution control in resource terms rather than in dollars, as a basis for decision. Visualizng a Federal a Federal law or regulatory policy to successfully mandate thermal efficiency is difficult, but an equivalent condition is national law on water and air quality standards. Many elements of a national strategy for macro-conservation of energy are already in place: government-financed R and D, demonstration projects, leasing and tax policies. But barriers strew the path toward implementing an innovative, energy-conserving system of marketing heat. Electric utilities, gas utilities, water utilities, or a combination of these, may be the logical service companies. Formation of a company with strictly a transmission function can be visualized. Whether, how, and to what extent transmission and distribution of heat should be regulated requires consideration by public agencies supported by economic research. The most nettlesome problem is water and water-rights administration. Public education is of crucial importance. (Meyer-General Electric TEMPO)
W79-01227

ENVIRONMENT, POWER, AND IMPACT ASSESSMENT: THE POLITICS OF INFORMATION,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 6G.
W79-01229

WATER RESOURCES AND THE LAND-WATER INTERFACE,
Illinois Univ. at Urbana-Champaign. Dept of Ecology, Ethology, and Evolution.
J. R. Karr, and I. J. Schlosser.
Science, Vol. 201, No. 4352, July 1978, p 229-234. 4 fig, 2 tab, 56 ref.

Descriptors: *Water law, *Water resources development, *Sediment-water interfaces, Legal aspects, Legislation, Water quality, Administration, Planning, Management, Water management(Applied), Erosion control.

Development and implementation of local and regional plans to control non-point source of pollution from agricultural land are major mandates of

section 208 of Public Law 92-500 (Federal Water Pollution Control Act Amendments of 1972). Many planners tend to equate erosion control as measured by the universal soil loss equation with improvements in water quality. Others implement channel management practices which degrade rather than improve water quality and thereby decrease the effectiveness of other efforts to control nonpoint sources. Planners rarely recognize the importance of the land-water interface in regulating water quality in agricultural watersheds. More effective planning can result from the development of management systems which incorporate theory from all relevant disciplines. (Steiner-Mass)
W79-01295

INLAND WETLAND DEFINITIONS,
Connecticut Univ., Storrs. Inst. of Water Resources.
M. W. Lefor, and W. C. Kennard.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 917, Price codes: A04 in paper copy, A01 in microfiche. Institute of Water Resources Report No 28, 1977. 69 p, 4 fig, 39 ref, 3 append. OWRT B-010-CONN(3). 14-31-0001-5062.

Descriptors: *Wetlands, *Legislation, *Legal aspects, *Land use, Geology, Hydrogeology, Hydrology, *Biology, *Economics, Political aspects, Public health, *Classification, Connecticut, *Inland wetland definitions, Resource management, *Systems ecology, *Land use regulation, *Legal definition, Connecticut Inland Wetlands and Watercourses Act, Sociology.

The results of a year-long study of various definitions of inland wetlands for the purpose of developing multifaceted technical, operational and legal definitions are presented. A multi-disciplinary group took part in project seminars and contributed working definitions from the following fields of study: geology, hydrogeology, hydrology, biology, systems ecology, economics, sociology, soil science, political science, public health and law. Contributions from the first six disciplines mentioned are discussed in detail in this report and were used in writing a final theoretical (ideal) definition of inland wetlands for the glaciated northeastern United States. A proposed legal definition for Connecticut is also offered with descriptors and explanations of terms. Such definitions are designed to help formulate criteria for policy analysis of wetlands and other water resources, and to unify and improve existing legislation on wetlands.
W79-01335

THE NATIONAL ENERGY PLAN,
Federal Energy Administration, Lakewood, CO. Region VIII.
For primary bibliographic entry see Field 6B.
W79-01480

LEGITIMACY OF WESTERN IDENTITY IN AN ECONOMIC BALANCE WATER - LAND - ENERGY - PEOPLE,
Federation of Rocky Mountain States, Denver, CO. Western States Energy Policy Office.
For primary bibliographic entry see Field 6B.
W79-01481

EFFECTS OF SELECTED CHANGES IN THE INSTITUTIONAL AND HUMAN ENVIRONMENT UPON OUTPUT PER UNIT OF INPUT,
Brookings Institution, Washington, DC.
For primary bibliographic entry see Field 6B.
W79-01491

AN ALTERNATIVE PERSPECTIVE ON COMMON PROPERTY RESOURCE ALLOCATION DECISIONS IN THE COASTAL ZONE,
Texas A and M Univ., College Station. Dept. of Political Science.
For primary bibliographic entry see Field 6A.
W79-01494

6F. Nonstructural Alternatives

IMPACT OF FLOODS AND ALTERNATIVE FLOOD CONTROL MEASURES ON THE DEVILS LAKE BASIN ECONOMY,
North Dakota State Univ., Fargo. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W79-01122

PROPOSED (GUIDELINE MODEL) COASTAL AND RIVERINE FLOOD PLAIN ZONING ORDINANCE,
Virginia State Water Control Board, Richmond. D. A. Kubicek.
April, 1976. 23 p.

Descriptors: *Local governments, *Virginia, *Insurance, *Flood plain zoning, Flood plains, Floodways, Non-structural alternatives, Regulation, Flood proofing, Land classification, Mapping, Land use.

Drafted as a guideline model for Virginia communities, this is a proposed, preliminary ordinance regulating local flood plain development. Its authors designed the model ordinance to comply with the requirements of the National Flood Insurance Program administered by the federal Department of Housing and Urban Development. The model ordinance would create local flood hazard districts and require that a permit be obtained by owners of property within a district for all proposed construction. The model ordinance provides for an interim definition of 100-year flood elevations, of floodways, and of floodplains. Also included is a list of land uses permitted in regular zoning districts and the general restrictions of the Floodplain Management Regulations which must be complied with to gain approval for a specific use. The model ordinance also provides for special structures which may be permitted under a zoning variance, but stipulates that a variance will be granted only as the result of an undue hardship. Finally, the model ordinance includes special regulations regarding floodproofing, mobile homes and mobil home subdivisions, and provides penalties for violation of the regulations. (Stump-Florida)
W79-01147

VESTED RIGHTS TO DEVELOP LAND: CALIFORNIA'S AVCO DECISION AND LEGISLATIVE RESPONSES,
J. M. Hawkes, and D. King.
Ecology Law Quarterly, Vol 6, No 4, p 755-83, 1978.

Descriptors: *Permits, *Regulation, *Land use, *Legal aspects, Legislation, State governments, Zoning, Coasts, Construction, Judicial decisions, California.

An increase of government regulation at all levels of land use planning has resulted in the assertion by many developers that their projects should be exempt from regulations promulgated after work has begun under the doctrine of vested rights. Developers have sought to broaden the traditionally narrow application of the doctrine and to exempt projects in relatively low stages of construction. California's codification of the vested rights doctrine requires: (1) substantial expenditures; (2) good faith reliance; and (3) a valid building permit in order for the developers to claim a vested right in completing their projects pursuant to the old regulations. In AVCO Community Developers, Inc. v. South Coast Regional Commission, the California Supreme Court faced the issue of whether the building permit standard should be replaced by another standard, or possibly replaced by a case-by-case determination of whether a vested right had been obtained in each particular set of facts. Although the court did not rule that a building permit would be required in every case, it did conform the narrowest construction of the vested rights doctrine consistent with procedural due process. (Stump-Florida)
W79-01148

PUBLIC INVOLVEMENT IN NATURAL RESOURCE DEVELOPMENT: A REVIEW OF WATER RESOURCE PLANNING,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Div. of Environmental and Urban Systems.
For primary bibliographic entry see Field 6B.
W79-01153

EFFECT OF FAILURE OF THE OLD RIVER CONTROL STRUCTURE ON MUNICIPAL AND INDUSTRIAL WATER SUPPLIES,
Louisiana State Univ., Baton Rouge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W79-01336

FRAGILE LANDS AND PEOPLE,
Colorado State Univ., Fort Collins. Dept. of Political Science.
For primary bibliographic entry see Field 6B.
W79-01487

6G. Ecologic Impact Of Water Development

COASTAL PLANNING: THE DESIGNATION AND MANAGEMENT OF AREAS OF CRITICAL ENVIRONMENTAL CONCERN,
North Carolina Univ. at Chapel Hill. School of Law.
For primary bibliographic entry see Field 5G.
W79-01152

WATER RESOURCES AND OTHER RELATED LAWS OF ILLINOIS.
Illinois State Dept. of Transportation, Springfield.
For primary bibliographic entry see Field 6E.
W79-01168

MAN'S IMPACT ON THE BARRIER ISLANDS OF NORTH CAROLINA,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
R. Dolan, P. J. Godfrey, and W. E. Odum.
American Scientist, Vol. 61, No. 2, p 152-162, March-April, 1973. 13 fig, 19 ref.

Descriptors: *Barrier Islands, *Beach erosion, *Salt marshes, *North Carolina, Aquatic plants, Dunes, Beaches.

Salt marsh formation on the sound side of the Outer Bank, North Carolina, is due in part to oceanic overwash. High tides and high waves occasionally succeed in eroding low-lying foredunes and carrying sand and shell completely across the island into the marshes. Stabilization of barrier islands by man has caused changes in beach, dune, and marsh morphology and in plant community composition. Artificial stability has changed a dynamic stable ecosystem capable of withstanding continual stress to one that would be destroyed if a major storm were to breach man-made barrier dunes. Survival of the remaining natural beach environments along the coast of North Carolina in areas recently purchased by the National Park Service requires a strategy of submission and rebuilding. (Howard-Mass)
W79-01220

AN ECOLOGICAL STUDY OF A BALDCYPRESS SWAMP IN ST. CHARLES PARISH, LOUISIANA,
Army Engineer District, New Orleans, LA.
For primary bibliographic entry see Field 2L.
W79-01226

ENVIRONMENT, POWER, AND IMPACT ASSESSMENT: THE POLITICS OF INFORMATION,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
M. D. Bradley.
In: Electric Power and the Civil Engineer Confer-

ence Papers, Power Division, Specialty Conference, Boulder, Colorado, Aug. 12-14, 1974, p 653-665, American Society of Civil Engineers, New York, N.Y., 1974. OWRT C-5222(No. 4213)(1), 14-31-0001-4213.

Descriptors: *National Environmental Policy Act, Information, Policy-making, Long-range planning, Environmental alternatives.

The National Environmental Policy Act of 1969 alters existing information flows in environmental policy-making by 'action-forcing' provisions requiring research, consideration of environmental consequences, and environmental impact statements. Experience for three years indicates that changes in information use occur slowly and unevenly. Policy-makers accept environmental information when its utility is greater than its cost. Utility, a summation, expresses the costs of obtaining and consuming information, and value conflict. Information demands lead institutions to seek knowledge, alternatives, and resources. The courts and environmental interest groups are forcing a more positive agency approach to NEPA. Long-range planning for fossil-fueled power generation will require understanding the provisions of NEPA, and analyzing projects as environmental alternatives.
W79-01229

TRADE OFF ANALYSIS IN ENVIRONMENTAL DECISIONMAKING: AN ALTERNATIVE TO WEIGHTED DECISION MODELS,
California Univ., Los Angeles. School of Architecture and Urban Planning.
A. Herson.
Journal of Environmenta Systems, Vol 7, No 1, 1977-78, p 35-44. (California Water Resources Center Project UCAL-WRC-W-503).

Descriptors: *Decision making, *Computer models, *Planning, Environmental effects, Model studies, Alternative planning, Systems analysis.

The weighting and aggregation of project impacts in weighted decision models commonly employed for environmental decisionmaking are reviewed. An alternative method, the systematic analysis of project impacts, is proposed for certain decision problems. Advantages of weighted decision models include the explicit quantification of decisionmaker values and the usefulness of systems analysis techniques for optimizing decisions. Disadvantages include the assumption of unanymity of values among affected publics and unresponsiveness to the needs of many participants in the decisionmaking process. For controversial decision problems with substantial implications for different social groups, explicit analysis of trade offs among impact areas or project goals is advanced as a method superior to the quantitative weighting and aggregation of impacts. (Snyder-Calif Davis)
W79-01242

THE EFFECT OF FIRE ON SPECIES COMPOSITION IN CYPRESS DOME ECOSYSTEMS,
Florida Univ., Gainesville. School of Forest Resources and Conservation.
For primary bibliographic entry see Field 4C.
W79-01292

INTERRELATION OF FOREST AND BOG.
Akademiya Nauk SSSR, Sibirskoye Otdeleniye.
For primary bibliographic entry see Field 2H.
W79-01297

THE WATER FACTOR IN THE SOCIAL HISTORY OF HONOLULU, HAWAII,
Hawaii Univ., Honolulu.
For primary bibliographic entry see Field 6B.
W79-01353

STREAM CHANNELIZATION IMPACTS ON SONGBIRDS AND SMALL MAMMALS IN VERMONT,
Massachusetts Univ., Amherst. Dept. of Forestry and Wildlife Management.
E. E. Possardt, and W. E. Dodge.
Wildlife Society Bulletin, Vol. 6, No. 1, p 18-24, 1978. 2 tab, 3 fig, 13 ref.

Descriptors: *Vermont, *Channel improvement, *Streams, *Non-game birds, *Small animals(Mammals), *Habitats, Environmental effects, Biological communities, Sampling, Stream improvement, Birds, Song birds, Mammals, On-site investigations, *Channelization, *Streamside habitats, *Species diversity, *White River Watershed(Vermont), Sandpipers, Thrushes, Vireos, Mice, Shrews.

The effects of stream channelization on songbirds and small mammals were documented in the White River watershed, Vermont 1 yr (1974) ad 2 yr (1975) after channelization had occurred. Birds were mist-netted during four sampling periods. The percentages of birds collected from channelized areas were 33 percent for fall 1974, 27 percent for spring 1975, and 38 percent and 46 percent for early and late summer 1975 sampling periods. Species diversity was significantly less in channelized areas for fall 1974 and early summer 1975. The greater diversity in non-channelized areas during spring 1975 was highly significant. No significant difference existed for late summer 1975. Swallows and spotted Sandpipers were more abundant in channelized areas while thrushes, vireos, and particularly warblers were more abundant in non-channelized areas. Small mammals were live trapped during three sampling periods. Of all small mammals collected 28 percent were from channelized areas in fall 1974, ad 39 percent each in early summer, and in late summer 1975. Shrews (Blarina brevicauda, Sorex cinereus) and jumping mice (Zapus hudsonicus, Napeozapus insignis) were the most adversely affected small mammals while the white-footed mouse (Peromyscus leucopus), the most abundant small mammal collected, recovered rapidly in the channelized areas. The most drastic impact on small mammal and songbird populations occurred at the channelized sites where streamside vegetation had been extensively destroyed. (EILS-Katz)
W79-01431

GREAT BLUE HERONS RESPOND TO NESTING HABITAT LOSS,
Fish and Wildlife Service, Corvallis, OR. Patuxent Wildlife Research Center.
C. J. Henny, and J. E. Kurtz.
Wildlife Society Bulletin, Vol 6, No. 1, p 35-37, 1978. 1 tab, 2 fig, 8 ref.

Descriptors: *Environmental effects, *Nesting, *Animal behavior, *Wildlife habitats, *Shore birds, Nests, Nesting cover, Behavior, Habitats, Shoreline cover, Waterbirds, Dams, River flow, Columbia River, *Great Blue Heron, Ardea.

Great blue herons (Ardea herodias) were found to be nesting on channel markers along the Columbia River near Umatilla, Oregon. After the construction of the John Day Dam changed the flow and boundaries of te Columbia River, the nesting trees of the herons were destroyed. As a result of this loss of nesting habitat, channel markers provided an adequate substitution due to their isolation from human activity and proximity to a food supply. Land managers may be able to establish artificial nesting sites where great blue heron nesting habitat has been destroyed. (EIS-Katz)
W79-01432

WATERFOWL COLLISIONS WITH POWER LINES AT A COAL-FIRED POWER PLANT,
Illinois Natural History Survey, Urbana.
W. L. Anderson.
Wildlife Society Bulletin, Vol. 6, No. 2, p 77-83, 1978. 2 fig, 3 tab, 7 ref.

Descriptors: *Waterfowl, *Environmental effects, *Mortality, *Power system operation, Animal behavior, Birds, Mallard duck, Blue-winged teal, Powerplants, Aquatic populations, Electrical equipment, On-site data collections, *American coots, Anas, *Power lines, *Lake Sangchris(Illinois).

Between 200 and 400 waterfowl (0.2-0.4 percent of maximum number present) were killed each fall, 1973-1975, by colliding with high-voltage transmission lines that cross the slag pit ast the Kincaid power Plant and adjacent Lake Sangchris, central Illinois. Mallards (Anas platyrhynchos) constituted 37% of the victims, blue-winged teals (A. discords) 17%, and American coots (Fulica americana) 25 percent. Blue-winged teals were most vulnerable to collisions andmallards least vulnerable. Factors contributing to frequency of collisions were (1) number of waterfowl present, (2) weather conditions and visibility, (3) species composition or behavior of birds, (4) disturbance, ad(5) familiarity of birds with the area. Power lines should not be built over water unless alternate routes do not exist; lines should not cross areas where waterfowl concentrate; and visibility of lines in problem areas should be enhanced. (EIS-Katz)
W79-01434

APPLYING A CHEMICAL MODELLING TECHNIQUE TO ECOLOGICAL PROBLEMS,
Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Physics and Engineering Lab.
For primary bibliographic entry see Field 5B.
W79-01444

CONFERENCE PROCEEDINGS - A CRITICAL ECONOMIC BALANCE, WATER - LAND - ENERGY - PEOPLE - HELD AT COLORADO STATE UNIVERSITY, PINGREE PARK CAMPUS ON JUNE 6-7, 1977,
Denver Federal Executive Board, CO.
For primary bibliographic entry see Field 6B.
W79-01478

7. RESOURCES DATA

7A. Network Design

TIME AVERAGED AREAL MEAN OF PRECIPITATION: ESTIMATION AND NETWORK DESIGN,
Puerto Rico Univ., Mayaguez.
For primary bibliographic entry see Field 2B.
W79-01357

PROGRAM FOR MONITORING SURFACE-WATER QUALITY IN FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-01376

7B. Data Acquisition

THE RELATIONSHIP BETWEEN RADAR REFLECTIVITY FACTOR AND HAIL AT THE GROUND FOR NORTHEAST COLORADO THUNDERSTORMS,
National Center for Atmospheric Research, Boulder, CO.
J. E. Dye, and B. E. Martner.
Journal of Applied Meteorology, Vol. 17, No. 9, p 1335-1341, September 1978. 5 fig, 3 tab, 17 ref.

Descriptors: *Hail, *Radar, *Remote sensing, *Colorado, Storms, Thunderstorms, Precipitation(Atmospheric), Rainfall, Measurement, Reflectance, Weather patterns, Weather, Meteorology, Radar reflectivity.

Data from the hailpad network of the National Hail Research Experiment were examined in relation to the equivalent radar reflectivity factors recorded in the lowest level sweeps of the radar beam over the pads during hailstorms in 1972 and 1976. The relationship between hail detected at the ground and reflectivity factor was examined for both areal coverage and on a point-by-point basis

for each hailpad. The comparisons showed that reflectivity factors of 55 dBZ often are measured when no hail is observed at the ground. Rain alone can give rise to reflectivities of this magnitude. The results of the study showed that in northeastern Colorado low-level equivalent radar reflectivity factors alone cannot be used to determine the region of hailfall at the ground, nor are they likely to augment quantitative measurements by a ground network of hail sensors. The results found in northeastern Colorado were compared to results from other geographical regions. (Sims-ISWS)
W79-01037

AN IMPROVED HYDRAZINE REDUCTION METHOD FOR THE AUTOMATED DETERMINATION OF LOW NITRATE LEVELS IN FRESHWATER,
Department of Scientific and Industrial Research, Taupo (New Zealand). Ecology Div.
For primary bibliographic entry see Field 5A.
W79-01042

REMOTE SENSING OF WATER LEVELS IN SMALL-DIAMETER WELLS,
Southern Piedmont Conservation Research Center, Watkinsville. GA.
A. D. Lovell, J. W. Ellis, R. R. Brice, and A. W. Thomas.
Agricultural Engineering, Vol. 59, No. 10, p 44-45, October, 1978. 4 fig.

Descriptors: *Water level fluctuations, *Logging(Recording), *Wells, *Remote sensing, *Soil water, Piezometers, Electronic equipment, Potentiometers, Pressure measuring instruments.

An inexpensive device which accurately records pressure head changes from near the soil surface to below the 10-ft. depth during a rainfall is described. It is capable of remote recording of water level changes in 1.3 cm (1/2 in.) ID piezometer tubes to within 5 mm (3/16 in.). The water level sensing component consists of a sensor and electric circuitry to control a 26-V d-c permanent-magnet reversible 25-rpm electric motor that moves the sensor vertically. The sensor is suspended over a pully on the end of a 10-turn 50-K potentiometer. It is connected to a data logger which measures resistance and, through calibration, expresses the water level in the well. (Purdin-NWAA)
W79-01101

WATER CHEMISTRY AND THE RELIABILITY OF ELECTRONIC FIELD INSTRUMENTS,
Colorado Univ., Boulder. Dept. of Environmental, Population, and Organismic Biology.
For primary bibliographic entry see Field 5A.
W79-01333

AN AUTOMATED PROCEDURE FOR THE SIMULTANEOUS DETERMINATION OF SPECIFIC CONDUCTANCE AND PH IN NATURAL WATER SAMPLES,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 2K.
W79-01374

GAS-DRIVEN PUMP FOR GROUND-WATER SUPPLIES,
Geological Survey, Lubbock, TX. Water Resources Div.
For primary bibliographic entry see Field 8C.
W79-01378

MICROWAVE REMOTE SENSING OF SEA ICE IN THE AIDJEX MAIN EXPERIMENT,
Geological Survey, Tacoma, WA. Water Resources Div.; and Department of the Environment, Ottawa(Ontario).
For primary bibliographic entry see Field 2C.
W79-01386

TIDAL SAMPLER,
Depart of Energy, Wash., DC. (Assignee).
D. W. Hayes.
U.S. Patent No. 4,095,471, 4 p, 1 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 971, No 3, p 927, June 20, 1978.

Descriptors: *Patents, *Sampling, *Water sampling, Tidal waters, Tidal energy.

An aparatus for pumping a sample of water or other liquid uses the energy generated from the rise and fall of the liquid level to force a sample of the liquid into a collection vessel. A suction vessel and booster vessel with interconnecting tubing and check valves are responsive to an oscillating liquid level to pump a portion of the liquid into a collection vessel. For optimum efficiency, the suction vessel must be completely submerged at the point of highest liquid level or high tide. The device is used for automatic and continuous sampling of water in remote locations and can be unattended for extended periods. (Sinha - OEIS)
W79-01388

TRICHLOROFLUOROMETHANE, A NEW HYDROLOGIC TOOL FOR TRACING AND DATING GROUND WATER,
Indiana Univ. at Bloomington.
For primary bibliographic entry see Field 2F.
W79-01422

7C. Evaluation, Processing and Publication

BED FORMS AND STRATIFICATION TYPES OF MODERN GRAVEL MEANDER LOBES, NUECES RIVER, TEXAS,
Texas Univ. at Austin. Bureau of Economic Geology.
For primary bibliographic entry see Field 2J.
W79-01044

COLORADO BIG THOMPSON FLOOD: GEOLOGIC EVIDENCE OF A RARE HYDROLOGIC EVENT,
Denver Univ., CO. Dept. of Geography.
For primary bibliographic entry see Field 2E.
W79-01047

CROPS-WIDE CONFERENCE ON COMPUTER-AIDED DESIGN IN STRUCTURAL ENGINEERING, VOLUME XI: EARTHQUAKE AND DYNAMIC ANALYSES,
Army Engineer Div. Huntsville, AL. Civil Structures Branch.
For primary bibliographic entry see Field 8G.
W79-01057

A BIOASSAY TECHNIQUE TO EVALUATE THE EFFECT OF SECONDARY EFFLUENT ON ALGAL INTERACTIONS IN THE CONNECTICUT RIVER,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 5C.
W79-01089

WELL LOGS...ARE THEY REALLY NECESSARY,
California State Dept. of Water Resources, Sacramento.
R. S. Ford.
Pacific Groundwater Digest, Vol. 1, No. 1, p 13-15, September, 1978.

Descriptors: *Well data, *Water wells, *Drillers logs, *Groundwater resources, Aquifer systems, Cross-sections, Aquifer characteristics, Monitoring, Water quality, Computer programs, Subsurface mapping, Water law.

Well logs or water well drillers' reports are a valuable tool in ground water resource planning. Well logs are used in the following ways: (1) To plot maps of aquifer systems at various depths or to locate buried channels and determine the direction of ground water flow; (2) To prepare geologic cross-sections of a basin to supplement the maps and provide a three-dimensional concept of the ground water basin; (3) To determine the water-yielding capability and storage capacity of aquifer systems by using the average specific yield of all material reported in the log; (4) To monitor ground water quality by sampling from only those wells which obtain water from a particular aquifer. Well logs are useful only if the exact locations of the wells are known. Many well logs are of no value because the driller gave only a rough idea of the well's location. Drillers benefit from filing accurate well logs in that they help formulate ground water management plans which require new wells or deepening of existing wells. Also, they have access to a vast store of hydrogeologic information to supplement their own knowledge gained through years of drilling experience. (Purdin-NWWA)
W79-01119

CHARACTERISTICS OF RAINFALL CONDITIONS WITH PARTICULAR REFERENCE TO NORTH EAST ENGLAND,
Northumbrian Water Authority, Gosforth (England).
For primary bibliographic entry see Field 2B.
W79-01247

ANALYTIC SOLUTIONS FOR COMPUTER FLOW MODEL TESTING,
Thayer School of Engineering, Hanover, NH.
For primary bibliographic entry see Field 2L.
W79-01256

GENERATION OF DAILY PRECIPITATION OVER AN AREA,
Agricultural Research Service, Temple, TX.
For primary bibliographic entry see Field 2B.
W79-01261

A SIMULATION OF THE HYDRAULIC EVENTS DURING AND FOLLOWING THE TETON DAM FAILURE,
Bureau of Reclamation, Denver, CO. Engineering Research Center.
For primary bibliographic entry see Field 8B.
W79-01269

SENSITIVITY ANALYSIS OF A PHOSPHORUS REMOVAL STRATEGY COMPUTER MODEL,
JBF Scientific Corp., Wilmington, MA.
For primary bibliographic entry see Field 5D.
W79-01310

OPTIMAL OPERATION OF LARGE AGRICULTURAL WATERSHEDS WITH WATER QUALITY CONSTRAINTS,
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 4D.
W79-01355

TIME AVERAGED AREAL MEAN OF PRECIPITATION: ESTIMATION AND NETWORK DESIGN,
Puerto Rico Univ., Mayaguez.
For primary bibliographic entry see Field 2B.
W79-01357

WATER RESOURCES OF THE UPPER HENRYS FORK BASIN IN EASTERN IDAHO.
Geological Survey, Boise, ID. Water Resources Div.
For primary bibliographic entry see Field 6D.
W79-01364

PROBABLE YIELDS OF WELLS IN THE NIAGARA AQUIFER, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.

R. W. Devaul.
Wisconsin Geological and Natural History Survey map, 1975. 1 sheet.

Descriptors: *Wisconsin, *Aquifers, *Maps, *Water yield, *Groundwater resources, Groundwater potential, Groundwater availability, *Niagara aquifer(Wis).

A map, at a scale of 1:100,000 shows the probable yields of wells in the Niagara aquifer, Wisconsin. The Niagara aquifer consists of all saturated rocks of Silurian and Devonian age in Wisconsin. It underlies less than 10 percent of the State but supplies water to numerous domestic wells in eastern Wisconsin. The aquifer is a fine- to medium-grained dolomite with a maximum thickness of about 600 feet. Water occurs in vertical and bedding-plane joints, many of which have been enlarged by solution. Well yields depend on the number and size of water-bearing fractures open to the well. Well yields, in gallons per minute, are areally delineated by three probability ranges--areas where chances of more than 100 gallons per minute are poor to areas where chances of more than 500 gallons per minute are good. Yields depend on the thickness of the aquifer penetrated as well as the lithology of the rocks. (Woodard-USGS)
W79-01367

RUNOFF FROM HYDROLOGIC UNITS IN FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
G. H. Hughes.
Florida Bureau of Geology Map Series No 81, 1978. 1 sheet, 3 fig, 13 ref.

Descriptors: *Runoff, *Geographical regions, *Florida, *Streamflow, *Average runoff, Rainfall-runoff relationships, Surface runoff, River basins, Topography, Geology, Evapotranspiration, Infiltration, Maps.

A map shows the average annual runoff from hydrologic units in Florida. Runoff is that part of precipiation that appears in surface streams, including the water that infiltrates to ground-water bodies and subsequently emerges in streams as well as that which flows overland directly into stream channels. In Florida as a whole the annual runoff averages about 14 inches, but it varies considerably with respect to both time and space. The average annual ruonff ranges from 5 inches or less in some parts of Florida to 30 inches or more in other parts. As a result of variations in rainfall between extreme wet and dry years, the annual runoff from a given area can vary several inches. Spatial variations in runoff result from regional differences in rainfall, differences in the evaporation potential of the atmosphere, and differences in the topographic and geologic characteristics of the land surface. In general, given the same rainfall, those physiographic factors that work to hold water on the land surface promote evapotranspiration and reduce runoff, and those that expedite the flow of water from an area reduce evapotranspiration and increase runoff from that area. (Woodard-USGS)
W79-01368

DISSOLVED-SOLIDS CONCENTRATIONS OF WATER IN THE NIAGARA AQUIFER, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
R. W. Devaul.
Wisconsin Geological and Natural History Survey map, 1975. 1 sheet.

Descriptors: *Wisconsin, *Dissolved solids, *Groundwater, *Maps, *Water quality, Aquifers, Water wells, *Niagara aquifer(Wis).

A map, at a scale of 1:100,000, shows the dissolved-solids concentration of water in the Niagara aquifer, Wisconsin. Natural water quality, as indicated by the total dissolved-mineral matter in the water, is shown for the sandstone aquifer on a contour map in 100 milligram per liter intervals. Areas with values greater than 500 milligrams per liter are not contoured, but dissolved-solids concentration is shown for individual wells yielding water containing more than 1,000 milligrams per liter total solids. These values are not considered areally representative and are not used in contouring. (Woodard-USGS)
W79-01369

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 2A: SOUTHERN FLORIDA, SURFACE WATER.
Geological Survey, Tallahassee, FL. Water Resources Div.
Water-Data Report FL-77-2A, July 1978. 662 p, 14 fig, 1 tab, 48 ref.

Descriptors: *Florida, *Hydrologic data, *Surface waters, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Data collections, Sites, *Southern Florida.

Water resources data for the 1977 water year for southern Florida include discharge records for 71 streams, stage-only records for 129 streams, elevations for 21 lakes, miscellaneous measurements, crest-stage partial records for 3 streams, and water quality data for approximately 229 surface water sites. These data represent the National Water Data System records collected by the U.S. Geological Survey and cooperating local, State and Federal agencies in Florida. (Woodard-USGS)
W79-01370

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 2B: SOUTHERN FLORIDA, GROUND WATER.
Geological Survey, Tallahassee, FL. Water Resources Div.
Geological Survey Water-Data Report FL-77-2B, July 1978. 620 p, 18 fig, 1 tab, 48 ref.

Descriptors: *Florida, *Hydrologic data, *Groundwater, *Water quality, Water analysis, Water temperature, Chemical analysis, Water wells, Water levels, Data collections, Sites, *Southern Florida.

Water resources data for the 1977 water year for southern Florida include water level measurement for 213 wells and water quality data for approximately 229 wells. These data represent the National Water Data System records collected by the U.S. Geological Survey and cooperating local, State and Federal agencies in Florida. (Woodard-USGS)
W79-01371

WATER RESOURCES DATA FOR NEW HAMPSHIRE AND VERMONT, WATER YEAR 1977.
Geological Survey, Boston, MA. Water Resources Div.
Water-Data Report NH-VT-77-1, August 1978. 196 p, 3 fig, 1 tab.

Descriptors: *New Hampshire, *Vermont, *Hydrologic data, *Surface waters, *Groundwater, Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water-resources data for the 1977 water year for New Hampshire and Vermont consist of records of stage, , discharge, and water quality of streams; contents of lakes and reservoirs; and ground-water levels. This report contains discharge records for 92 gaging stations, stage records for 4 lakes, month end contents for 25 lakes and reservoirs, water quality for 9 gagin stations, and water levels for 19 observation wells. Also includeed are data for 39 crest-stage and 2 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. A few pertinent stations in bordering States and Province of Quebec are also included. These data represent that portion of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in New Hampshire and Vermont. (Woodard-USGS)
W79-01372

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 1: NORTHEAST FLORIDA.
Geological Survey, Tallahassee, FL. Water Resources Div.
Water-Data Report FL-77-1, July 1978. 672 p, 33 fig, 1 tab, 48 ref.

Descriptors: *Florida, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *Northeast Florida.

Water resources data for the 1977 water year in northeast Florida include discharge records for 46 streams, stage only records for 24 streams, elevations for 67 lakes, water level measurements for 79 wells, crest-stage partial records for 20 streams, and water quality data for 106 streams and 92 wells. These data represent the National Water Data System record collected by the U.S. Geological Survey and cooperating local, State and Federal agencies in Florida. (Woodard-USGS)
W79-01373

CHEMICAL QUALITY OF WATER USED FOR MUNICIPAL SUPPLY IN FLORIDA, 1975,
Geological Survey, Tallahassee, FL. Water Resources Div.
G. G. Phelps.
Florida Bureau of Geology, Tallahassee, Map Series No 82, 1978. 1 sheet, 2 fig, 1 tab, 6 ref.

Descriptors: *Water quality, *Chemical analysis, *Water supply, *Municipal water, *Florida, Maps, Dissolved solids, Water quality standards, Water treatment, Untreated water quality, Environmental Protection Agency.

The U. S. Geological Survey collected quality-of-water information from more than 120 Florida cities and towns in 1975. Untreated samples (samples of water taken directly from wells or streams) were analyzed for comparison with the Environmental Protection Agency's Water Quality Criteria for untreated water. Water treatment by most municipalities consists of filtration, aeration, and disinfection with chlorine. When several municipalities in the same county were sampled, the sample with the highest dissolved-solids concentration (and thus generally the poorest overall quality) was indicated on a map. Therefore, one can expect untreated source water used for municipal supply in each county to be of the quality shown on the map or better. Nearly all the municipal water supplies in Florida meet the Environmental Protection Agency's Water Quality Criteria, which are outlined in the text. Those counties where exceptiions occur are shown in inset figures. Failure to meet all the recommendations does not imply that the water is unsafe. Rather, the criteria are recommendations to be used as a goal to establish and maintain good water quality. dissolved-solids concentrations of the source waters sampled ranged from less than 100 mg/liter to more than 500 mg/liter. A reference is given for detailed information about the source of municipal water supplies, including analyses of samples. (Woodard-USGS)
W79-01375

PROGRAM FOR MONITORING SURFACE-WATER QUALITY IN FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
L. J. Slack.
Florida Bureau of Geology, Tallahassee, Map Series No 76, 1977. 1 sheet, 2 fig, 6 tab, 2 ref.

Descriptors: *Water quality, *Surface waters, *Florida, *Maps, Data collections, Sites, Network design, Monitoring, Sampling, Frequency, Cost sharing, Publications, Data storage and retrieval.

The purpose of this water atlas is to inform the reader of the overall operation and extent of the program for monitoring surface-water quality in Florida: the history and funding of the program, the purpose and objectives of the network of monitoring stations by hydrologic categories, the frequencies of sampling, the types of water-quality data collected, and how these data are published and used. The distribution of stations in the monitoring program as of April 1976 is shown on a large map. The distribution and number of stations in a given area is determined by the extent to which information is needed. This generally is the result of water-quality problems related to increasing usage by municipalities, industries, and ag
W79-01376

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN MONTANA, OCTOBER 1977 THROUGH SEPTEMBER 1978.
Geological Survey, Helena, MT. Water Resources Div.
Open-file report 78-436, May 1978. 39 p, 3 fig, 2 tab.

Descriptors: *Montana, *Hydrologic data, *Networks, *Surface waters, *Water quality, Sedimentation, Groundwater, Sampling, Sites, Data collections, Annual.

Hydrologic-data stations are maintained at selected sites throughout Montana to collect basic information concerning streamflow ground-water levels, quality of water, sediment concentrations in streams, and depth and water content of snowpack. The network of stations is revised periodically to ensure collection of meaningful and worthwhile data. This report covers investigations made from October 1977 through September 1978. The locations of data-collection stations are shown on maps for surface water and water quality. Surface-water and water-quality stations in operation as of October 1977 also are listed in tables. (Woodard-USGS)
W79-01379

DISSOLVED-SOLIDS CONCENTRATIONS AND LOADS IN FLORIDA SURFACE WATERS,
Geological Survey, Tallahassee, FL. Water Resources Div.
J. E. Dysart, and D. A. Goolsby.
Florida Bureau of Geology, Tallahassee, Map Series No 77, 1977. 1 sheet, 2 fig, 2 tab, 10 ref.

Descriptors: *Dissolved solids, *Florida, *Surface waters, *Water quality, Streams, Rivers, Canals, Springs, Maps, *Dissolved-solids concentrations, *Dissolved-solids discharge, *Dissolved-solids load.

Maps and tables of dissolved-solids data in Florida surface waters show considerable statewide variation. Concentrations of dissolved solids are highest in the canal system of south Florida, the St. Johns River basin, and most major springs. Other Florida surface waters have concentrations of less than 200 mg/liter. The St. Johns, Apalachicola, and Suwannee Rivers carry 66 percent of the 13 million tons of dissolved-solids load discharged annually to the Gulf of Mexico and Atlantic Ocean. Seventeen percent of the annual load is carried by canals and 17 percent by the smaller rivers. (Woodard-USGS)
W79-01382

HYDROGEOLOGIC MAPS OF A FLOOD DETENTION AREA PROPOSED BY SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT GREEN SWAMP AREA, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
A. T. Rutledge, and H. F. Grubb.
Open-file report 78-460, 1978. 7 sheets.

Descriptors: *Hydrogeology, *Groundwater recharge, *Aquifer characteristics, *Maps, Data collections, Core drilling, Hydraulic conductivity, *Florida, *Green Swamp area(Fla), *Florida aquifer, *Withlacoochee River(Fla), *Little Withlacoochee River(Fla), Clay beds, Leakance.

Information about the hydrogeology of that part of the Green Swamp area which has been designated by Southwest Florida Water Management District as the Flood Detention Area is given on seven maps. The maps show (1) core-hole numbers, (2) sand thickness, (3) clay thickness, (4) clay vertical hydraulic conductivity, (5) clay leakance, (6) depth to Floridan aquifer, and (7) altitude of top of Floridan aquifer. The data were obtained from 85 core holes drilled in 1977 and from 24 core hole drilled previously. The 127 square-mile study area is part of the headwaters of the Withlacooche River and the Little Wthlacoochee River. The data will be useful in future water-resources planning and in a concurrent interpretive study of the Green Swamp area. (Woodard-USGS)
W79-01383

GROUND-WATER RESOURCES AND GEOLOGY OF COLUMBIA COUNTY, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 2F.
W79-01384

GEOMORPHOLOGIC CHARACTERISTICS OF FOURTEEN INDIANA WATERSHEDS OBTAINED FROM A COMPUTER DATA BANK OF STREAM NETWORKS,
Purdue Univ., Lafayette, IN. School of Civil Engineering.
For primary bibliographic entry see Field 4D.
W79-01426

APPLYING A CHEMICAL MODELLING TECHNIQUE TO ECOLOGICAL PROBLEMS,
Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Physics and Engineering Lab.
For primary bibliographic entry see Field 5B.
W79-01444

8. ENGINEERING WORKS

8A. Structures

FIRST INSPECTIONS HIGHLIGHT US DAMS THREAT.
For primary bibliographic entry see Field 8G.
W79-01048

BREAKWATER,
British Petroleum Co. Ltd., Sunbury-on-Thames (England). (Assignee).
D. H. Desty, and R. Duckworth.
U.S. Patent No. 4,098,086, 9 p, 5 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 972, no 1, p 59, July 4, 1978.

Descriptors: *Patents, *Breakwaters, *Engineering structures, Coastal structures, Shore protection, Waves(Water), Ocean waves, Floating, Offshore platforms, Attenuation.

A floating breakwater suitable for reducing the height of waves comprises: a plate of material substantially rigid in its beam direction; means for positioning the plate at right angles to the direction of the waves thus making the beam direction parallel to the wave direction; the plate having a wavelength to beam ratio of 0.5 to 5; means for locating the upper surface of the plate at a depth of 1/5 to 1/40 the plate beam length below the mean surface level; and means for allowing rocking of the plate along a horizontal axis substantially at right angles to the plate beam direction. In order to facilitate this rocking mode, particularly when reducing wavelengths greater than the plate beam length, the plate preferably has considerable mass located near the central axis parallal to the water surface and at right angles to the wave direction giving a low moment of inertia about this axis. The object of the invention is to provide a floating wave reduction system which substantially attenuates wave height during its passage towards the installation being protected. (Sinha-OEIS)
W79-01400

8B. Hydraulics

FISH LADDER FOR CHARLES RIVER DAM, CHARLES RIVER, MASSACHUSETTS, HYDRAULIC MODEL INVESTIGATION,
Army Engineer Div. North Pacific, Bonneville, OR. Div. Hydraulic Lab.
For primary bibliographic entry see Field 8I.
W79-01052

TRANSMISSIVITY AND HYDRAULIC CONDUCTIVITY OF SATURATED SEDIMENTARY ROCKS IN THE HANFORD RESERVATION,
Atlantic Richfield Hanford Co., Richland, WA.
R. A. Deju, and W. K. Summers.
Available from the National Technical Information Service, Springfield, VA 22161 as ARH-C-00007, Price codes: A03 in paper copy, A01 in microfiche. Report ARH-C-00007(CA-168-RAD-5), April 1, 1975. 236 p, 9 fig, 7 tab, 27 ref. ERDA AT(45-1)-2130.

Descriptors: *Groundwater, *Hydraulic conductivity, *Transmissivity, *Washington, *Columbia River, Rocks, Sedimentary rocks, Groundwater movement, Drillers logs, Lithologic logs, Geology, Porosity, Storage coefficient, On-site investigations, Laboratory tests, *Hanford Reservation(Wash).

The Hanford Reservation, Washington, occupies 365,000 acres (570 sq mi) of land within the Columbia Basin geologic province. This location was selected in early 1943 by the Army Corps of Engineers as the site for reactor and chemical separation facilities for the production and purification of plutonium needed in the development of nuclear weapons. To understand adequately the groundwater flow regime of the Hanford Reservation, data were gathered and tests were conducted by various investigators to define appropriately the hydraulic characteristics of the underlying sediment. This report examined the overall hydraulic characteristics of the sediment overlying the topmost basalt flow beneath Hanford. All data available were examined and used in the preparation of the report. The sedimentary rocks of the Pasco Basin include glaciofluviatile deposits and the Ringold Formation. They also may include sedimentary rocks interbedded with the basalts. In terms of the groundwater flow continuum, these rocks are divided into the unsaturated zone, the upper dominantly coarse-clastic part of the zone of saturation, and the lower dominantly fine-grained part of the zone of saturation. Drillers' logs combined with pumping tests were used to estimate and map the transmissivity and mean hydraulic conductivity of the saturated sedimentary rocks. The logs showed that the largest values of transmissivity and mean hydraulic conductivity in the unconfined aquifer occur where the saturated thickness of the Pasco Gravels is largest. Intermediate values occur where the Pasco Gravels are thinnest and the Middle Ringold Conglomerates are thickest. Low values occur where the Middle Ringold Conglomerate is thin, the Pasco Gravels are non-existent, and the Lower Ringold makes up the bulk of the saturated section. (Sims-ISWS)
W79-01053

SIMULATION OF FLOOD WAVES IN CHANNELS,
Bristol Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W79-01060

EVALUATION OF DESIGN METHODS OF SUBSURFACE DRAINAGE FACILITIES FOR HIGHWAYS,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 4C.
W79-01061

FIELD STUDY OF SEDIMENT TRANSPORT CHARACTERISTICS OF THE MISSISSIPPI RIVER NEAR FOX ISLAND (RM 355-6) AND BUZZARD ISLAND (RM 349-50),
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 2J.
W79-01065

A WATER WELL EVALUATION SYSTEM,
B. G. Sweet.
Mining Engineering, Vol. 30, No. 8, p 1173-1175, August, 1978. 2 fig, 2 tab.

Descriptors: *Water wells, *Water valves, *Evaluation, Pumps, Regression analysis, Economics, Corrosion, Damages.

Increased use of ground water in mining and agriculture has created a need for practical, scientific methods of evaluating water wells and indentifying conditions which will become major concerns in repair and maintenance. Natural and man-made causes of physical damage to wells are identified. Factors which contribute to corrosion are discussed. Erosion due to suspended solids, seismic effects, and subsidence are other damaging factors. The rate of well deterioration varies with type of formation penetrated, water quality, chemical composition, drilling methods, well development, and well completion materials. Economic factors should also be considered. Good quality water is a valuable resource. Value is also influenced by the location of the well relative to a municipal water supply, its yield and the cost of producing a unit quantity of water. Proper evaluation of pumping equipment depends considerably on length of service and duty cycle. Power and maintenance costs are directly related to the duty cycle. Methods of water well evaluation are generally derived by statistical sampling of the cost of a number of similar wells. Plotting these values and applying regression analysis provides a reasonable formula for estimating the cost of constructing and equipping a well of similar design. (Purdin-NWWA)
W79-01102

FLUID DEVELOPMENT FOR DRILLING SLOUGHING AND HEAVING SHALES,
Amoco Production Co., Tulsa, OK.
For primary bibliographic entry see Field 8G.
W79-01104

THE USE OF INCLINED BOREHOLES FOR WELL DEVELOPMENT,
Institute of Geological Science, London, (England).
J. B. Day , K. Rowe, M. Price, and T. K. Tate.
Journal of Institute of Water Engineers and Scientists, Vol. 32, No. 4, p 329-340, July, 1978. 8 fig, 1 tab, 3 ref.

Descriptors: *Drilling, *Boreholes, *Well development, Fractures(Geologic), Aquifer, Effective radius, Water yield, Water quality, Economics.

The development of water wells by drilling intersecting inclined bores ('rakers') is described. Rakers would simply enlarge the effective radius of the central well in a homogeneous aquifer, but in a fractured-rock aquifer they would greatly increase the yield by intersecting and connecting fractures. A raker well was modelled and tested in a sand tank under various water table levels. The yield of the central well increased about one-third and drawdown was reduced by about 50 percent. Engineering and hydrogeologic factors governing the choice of raker well configuration are discussed. In a field test on fractured chalk at Lyng, Norfolk, three rakers were drilled at 45 degrees using conventional rotary drilling methods. They intersected a central well about 31 m below the average level of the water table. Variable-rate pumping tests were made after drilling the central well and after drilling of each raker. The total effect of the three rakers was to increase the yield, for a drawdown of 20 feet, by 120 percent. Water quality parameters of discharge samples from the central well are tabulated. The economics of constructing a faker well system is compared with that of other methods of development. Inclined drilling may boost the yield of existing wells under suitable hydrogeologic conditions. (Purdin-NWWA)
W79-01107

USING LARGE DIAMETERS TO INCREASE WELL STORAGE,
National Water Well Association, Worthington, OH.
H. W. Heiss.
Water Well Journal, Vol. 30, No. 11, p 65-66, November, 1978, 1 tab.

Descriptors: *Water storage, *Water tanks, *Wells, Well yield, Pumped storage, Water supply, Dewatering, Water demand.

Low yield wells requires some form of storage. Storage system design is based on estimates of present and future water demands. The best storage area is the well itself. A well's storage capacity can be increased by drilling larger diameters. Water system pressure tanks, can also help provide storage as well as prevent rapid cycling of the pump motor. The size of the tank is determined by well yield, pump capacity, maximum water requirement and operating pressure. In some cases, both a large diameter well and an oversized pressure tank may be required. Light industry and agriculture require greater well yields and storage volumes. Water is pumped from the well into above ground non-pressurized tanks. Water levels in low yield wells must be carefully controlled to avoid dewatering. This can be accomplished by using solenoid activated pump switches attached to water level sensors in the well or by reducing the pump motor speed below the well's production capacity. (Purdin-NWWA)
W79-01109

DRILLING LARGE DIAMETER WELLS: THE PROOF IS IN THE PLANNING,
National Water Well Association, Worthington, OH.
H. W. Heiss.
Water Well Journal, Vol. 30, No. 11, p 72-73, November, 1978.

Descriptors: *Wells, *Drilling, Design, Construction, Gravels, Rotary drilling.

The steps involved in bidding for, site testing, and construction of large diameter wells are described. Bidding requires a thorough knowledge of local geology and water quality. Potentially difficult drilling conditions mandate higher bids. A completed large municipal well will usually bring a price between $250,000 and $500,000. Once test holes have been completed by a driller and their results interpreted by a geologists, an engineer begins designing the wel. Once well design is complete, the drilling manager is ready to plan his strategy. An example is given of a large diameter gravel pack well drilled with a Failing-JED reverse rotary rig. A 61-inch, multi-layered roller cone bit was used to a depth of 38 feet. The borehole was cased with 3/8 inch standard steel. Drilling continued using a 54-inch reverse rotary bit. Number 3 (1/4 inch X 1/8 inch) gravel was used from the base of the 54-inch borehole to 55 feet below the surface. Atop the gravel pack material extending into the 61-inch casing, a mixture of medium sand and Aqua-Gel formed an impervious seal to a depth of 30 feet. (Purdin-NWWA)
W79-01110

REGIONAL GEOLOGY SERIES: PART X,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 2F.
W79-01115

THE EXPANDING GEYSERS,
For primary bibliographic entry see Field 4B.
W79-01116

DRIFT VELOCITY OF SURFACE FILMS OVER WAVES,
Connecticut Univ., Storrs. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W79-01139

REAERATION PERFORMANCE OF STEPPED CASCADES,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W79-01249

CONTROL OF TRANSIENTS IN SERIES CHANNEL WITH GATES,
Adelaide Univ. (Australia). Dept. of Civil Engineering.
W. E. Bodley, and E. B. Wylie.
Journal of the Hydraulics Division, American Society of Civil Engineers, Proceedings Paper 14101, Vol. 104, No. HY10, p 1395-1407, October 1978. 15 fig, 11 ref, 2 append.

Descriptors: *Hydraulic transients, *Gate control, *Reservoirs, *Open channel flow, *California, Irrigation, Aqueducts, Hydraulics, Flow control, Channels, *Underflow gates, *Gate stroking, Controlled flow.

The concept of controlled flow in open channels had been applied previously to a single channel with a control gate at each end. The reported study applied this concept of 'gate-stroking' to a channel consisting of a number of pools in series. It has been shown that the motions of all control gates in such a channel can be 'designed' such that a change in channel discharge and depth are effected in a prescribed manner at any selected cross section. Furthermore, when such 'stroking-designed' gate motions are completed, the specified, final, steady discharge exists everywhere in the channel, with no residual disturbance from the transient. The application was illustrated for a series of 3 pools separated by underflow gates. The series of pools originated and terminated in underflow gates, both with reservoir conditions on the other side. (Singh-ISWS)
W79-01255

ANALYTIC SOLUTIONS FOR COMPUTER FLOW MODEL TESTING,
Thayer School of Engineering, Hanover, NH.
For primary bibliographic entry see Field 2L.
W79-01256

PROCEEDINGS OF DAM-BREAK FLOOD ROUTING MODEL WORKSHOP.
Water Resources Council, Washington, DC. Task Force on Dam-Break Flood Routing.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 437, Price codes: A19 in paper copy, A01 in microfiche. Workshop held Oct. 18-20, 1977, Bethesda, MD: Hydrology Committee United States Water Resources Council, Washington, DC., October 1977. 437 p.

Descriptors: *Conferences, *Reviews, *Dam failure, *Flood routing, *Model studies, Flood waves, Dams, Mathematical models, Mathematics, Flood profiles, Channels, Rivers, Analytical techniques, Analysis, Waves(Water), Bores, Water levels, Theoretical analysis, Dam-break waves.

The Proceedings is a collection of papers summarizing the participants' experiences with modelling dam-break flood waves. Collectively, the papers represent a fairly comprehensive report of the cur-

rent state-of-the-art of modeling dam-break flood waves. Recent concern over the catastrophic effects of flood waves produced by dam failures, such as the Toccoa, Johnstown, Teton, Rapid City,and Buffalo Creek floods, has focused on the need for clearer understanding within the engineering community of existing alternative methods for predicting such phenomena. The Hydrology Committee of the Water Resources Council initiated a workshop to provide a forum for presentation and discussion of alternative methods for predicting dam-break flood waves. Participants were solicited from government agencies, universities, and private consultants. (See W79-01263 thru W79-01278) (Humphreys-ISWS)
W79-01262

THE DAM-BREAK WAVE AND THE BORE COLLAPSE ON A BEACH,
North Carolina State at Raleigh. Dept. of Civil Engineering.
M. Amein.
In: Proceedings of Dam-Break Flood Routing Model Workshop; Workshop held October 18-20, 1977, Bethesda, Maruland: Hydrology Committee, United States Water Resources Council, Washington, D.C., p 1-16, October 1977. 10 fig, 19 ref.

Descriptors: *Dam failure, *Flood waves, *Mathematical models, *Rivers, Beaches, Analytical techniques, Model studies, Theoretical analysis, Channels, Mathematics, Waves(Water), Bores, Method of characteristics, Dam-break waves.

The movement of the dam-break wave has similarities with the bore collapse on a beach. The bore, a forerunner of the long wave behind it, advances toward the shore as a wall of water, and it changes in height and speed as it advances toward the shore. The positive dam-break wave advances through the downstream wet channel in a similar manner. The wave runup up the dry beach is similar to the dam-break wave on a dry bed. The shallow water equations govern the motion of the dam-break wave and the long waves in the sea. The propagation of long waves has been studied by the method of characteristics. The inception and development of bores are predicted by this method. The entire motion is determined by coupling the jump conditions at the bore to the equations of the characteristics. The same procedure was applied to the dam-break wave in dry and wet channels. The bore at the beach and the initial conditions at the dam site become singular points. Characteristics drawn from the vicinity of the singular point provide details of the water surface profiles for the dam-break wave and also for the wave runup. The effect of friction can be included by the use of a formula relating shear stress to the mean velocity. Numerical examples illustrated the application of the method. (See also W79-01262) (Humphreys-ISWS)
W79-01263

UNSTEADY FLOW ANALYSIS OF DAM-BREAK WAVES,
Wisconsin Electric Power Co., Milwaukee.
S. T. Su.
In: Proceedings of Dam-Break Flood Routing Model Workshop; Workshop held October 18-20, 1977, Bethesda, Maryland: Hydrology Committee, United States Water Resources Council, Washington, D.C., p 18-46, October 1977. 17 fig, 3 tab, 12 ref.

Descriptors: *Dam failure, *Waves(Water), *Unsteady flow, *Mathematical models, Analysis, Analytical techniques, Mathematical studies, Model studies, Flood waves, Theoretical analysis, Flood routing, Flow, Channels, Flash floods, Flood profiles, Dam-break waves, One-dimensional flow.

This paper presented an unsteady flow analysis on the flood waves generated by instantaneous release of a reservoir resulting from a dam failure. A mathematical model based on Dressler's perturbation theory was extended and developed to include channel boundary resistance, cross sectional geometry, and bed slope. Theoretical results obtained from the mathematical model include water surface profiles, mean velocity distributons, and the trajectory of positive wavefront for rectangular, parabolic, and triangular cross sections. Experimental data extracted from literature were compared with theoretical results. The relative significance of channel boundary resistance, cross sectional geometry, and bed slope on the wave motion was determined. Classification of flow regimes as related to local Froude numbers, and time and space was analyzed. A numerical example was given to illustrate the application of the mathematical model. Due to the truncation error in the development of the mathematical model, the channel slope is limited to the nearly horizontal channel slope. (See also W79-01262) (Humphreys-ISWS)
W79-01264

FLOOD PLAIN INUNDATION CAUSED BY DAM FAILURE,
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
J. O. Blanton, III.
In: Proceedings of Dam-Break Flood Routing Model Workshop; Workshop held October 18-20, 1977, Bethesda, Maryland: Hydrology Committee, United States Water Resources Council, Washington, DC p 47-64, October 1977. 10 fig, 1 tab, 5 ref.

Descriptors: *Dam failure, *Waves(Water), *Flood routing, *Flood profiles, *Idaho, Flood plains, Flooding, Analytical techniques, Hydrograph analysis, Mathematical models, Model studies, Analysis, Rivers, Flood waves, *Snake River(Idaho), *Teton Dam(Idaho), Dam-break waves, Hydrologic routing.

Predictions of flood plain inudation due to dam failure are required occasionally when time, money, or data are not available for more sophisticated analyses involving solution of the unsteady-flow equations in open channels. Recognizing the limitations, failure hydrographs were routed through the valley downstream by means of an implicit-finite difference methods. The procedure consists of a mass balance of inflow, outflow, and change in storage per unit of time within a reach. The average hydraulic properties for all subreaches were computed from the best data available and used in the routing. Possible backwater effects caused by valley constrictions were checked by steady-flow backwater computations in which the attenuated peak flows from the flood routing were applied at appropriate valley sections. Flood elevations were adjusted upward if indicated. The results indicated that an application of the mass continuity principle alone, as in a hydrologic routing, is quite inadequate for modeling the rapidly changing flow characteristics just downstream from a dam break. The routing improves in reliability as the speed of the flood wave decreases. (See also W79-01262) (Humphreys-ISWS)
W79-01265

SIMPLIFIED ROUTING THROUGH RESERVOIR,
Federal Energy Regulatory Commission, Washington, DC.
For primary bibliographic entry see Field 4A.
W79-01266

FLOODS FROM BREACHING OF DAMS,
Nunn, Snyder and Associates, Fairfax, VA.
F. F. Snyder.
In: Proceedings of Dam-Break Flood Routing Model Workshop; Workshop held October 18-20, 1977, Bethesda, Maryland: Hydrology Committee, United States Water Resources Council, Washington, D.C., p 75-88, October 1977. 3 fig, 2 tab, 3 ref.

Descriptors: *Dam failure, *Flood routing, *Discharge(Water), *Analytical techniques, Rivers, Reservoirs, Hydrographs, Flood profiles, Flood waves, Peak discharge, Hydrograph analysis, Methodology, *Teton Dam(Mont), Dam-break waves.

The hydrograph computations are accomplished in 3 stages after definition of a geometric shape aapproximating cross sections for the dam and reservoirs. The initial discharge and depth of outflow for the observed or assumed breach are computed first. Next, the volume of the failure wedge of the reservoir and time of emptying are computed and used to define the variation of discharge and depth of flow during that period of time so as to recede to the capacity of the breach for normal conditions of discharge and depth of flow. The final phase consists of computing the recession of the outflow from the remaining slope reservoir storage. The outflow hydrograph is routed to downstream points of interest using reservoir-type storage, lineal or variable, and a translation lag time. The Teton Dam and Reservoir were used to illustrate the application of the procedures presented. (See also W79-01262) (Humphreys-ISWS)
W79-01267

UNSTEADY FLOW MODELING OF DAM-BREAK WAVES,
Tennessee Valley Authority, Knoxville.
J. T. Price, G. W. Lowe, and J. M. Garrison.
In: Proceedings of Dam-Break Flood Routing Model Workshop; Workshop held October 18-20, 1977, Bethesda, Maryland: Hydrology Committee, United States Water Resources Council, Washington, D.C., p 89-130. October 1977. 31 fig, 8 ref.

Descriptors: *Dam failure, *Flood waves, *Peak discharge, *Mathematical models, Model studies, Unsteady flow, Flood routing, Discharge(Water), Rivers, Reservoirs, Analytical techniques, Hydrographs, Dam-break waves.

The techniques used by TVA in computing flood waves generated by tota or partial failures of large dams were described, and comparisons were made with dam-break theory and with computational results of other investigators using different methods. The influence of breach width on the dam-break wave in a rectangular channel was described for both the frictional and non-frictional cases. Finally, some recent applications of the methods to the TVA system were described. The main conslusions from these studies were: (1) Use of the gradually varied flow equations provides a practical engineering solution for obtaining the complete hydrographs from a failed structure. (2) Starting conditions for the connected reservoirs at the failed dam net point can be estimated from the dam-break and critical-flow equations. (3) Peak outflow obtained using the classical dam-break equations and peak outflow obtained with the mathematical model are in remarkable agreement. (4) For partial dam failures, separate reservoir models are required. The outflow hydrograph must be obtained by using as a downstream boundary condition a rating curve developed by model studies or anlaytical methods for the geometry of the failed section. (See also W79-01262) (Humphreys-ISWS)
W79-01268

A SIMULATION OF THE HYDRAULIC EVENTS DURING AND FOLLOWING THE TETON DAM FAILURE,
Bureau of Reclamation, Denver, CO. Engineering Research Center.
R. J. Brown, and D. C. Rogers.
In: Proceedings of Dam-Break Flood Routing Model Workshop; Workshop held October 18-20, 1977 Bethesda, Maryland: Hydrology Committee, United States Water Resources Council, Washington D.C., p 131-163, October 1977. 15 fig, 18 ref.

Descriptors: *Dam failure, *Model studies, *Flood routing, *Idaho, Computer programs, Mathematical model, Analytical techniques, Analysis, Discharge(Water), Hydrographs, Hydrograph analysis, Flood waves, Flood profiles, Rivers, Peak discharge, *Teton Dam(Idaho), Dam-break waves, Method of characteristics.

Two digital computer programs were utilized to simulate the hydraulic events during and following the Teton Dam failure. The first program routes a flood past a dam using the storage equation and considers the effects of an inflow hydrograph and the operation of powerplants, spillways and outlet works. This program can calculate a progressive

erosion (breach) if an earth dam is overtopped, and can simulate a piping failure condition. This program was used to simulate the events at the Teton Dam site and to calculate the outflow hydrograph during the failure. The second program, TAHS (Transient Analysis of any Hydraulic System), is a general purpose program used to solve the unsteady-flow equations in open channels, closed conduits, or combinations of both. This program was used to route the outflow hydrograph from Teton Dam to American Falls Reservoir. The results of this study were compared with the high water inundated area recorded by USGS. (See also W79-01262) (Humphreys-ISWS)
W79-01269

THE DEVELOPMENT AND TESTING OF A DAM-BREAK FLOOD FORECASTING MODEL,
National Weather Service, Silver Spring, MD. Hydrologic Research Lab.
D. L. Fread.
In: Proceedings of Dam-Break Flood Routing Model Workshop; Workshop held October 18-20, 1977, Bethesda, Maryland: Hydrology Committee, United States Water Resources Council, Washington, D.C., p 164-197, October 1977. 12 fig, 29 ref, 1 append.

Descriptors: *Flood forecasting, *Dam failure, *Mathematical models, *Flood routing, *Idaho, *West Virginia, Theoretical analysis, Model studies, Analytical techniques, Mathematical studies, Flood profiles, Discharge(Water), Equations, Methodology, Hydrograph analysis, Hydrographs, Rivers, Peak discharge, Numerical analysis, *Teton Dam(Idaho), *Buffalo Creek(WVa), Dam-break waves, Model testing.

The theoretical aspects of a mathematical model to forecast the flood hydrograph resulting from a breached dam were presented. The model is composed of two basic elements. The first simulates the outflow hydrograph due to a time-dependent, erosion-type breach of a dam using a hydraulic weir representation of the outflow through the breach while simultaneously considering the effects of the reservoir storage depletion and the inflow hydrograph via either a storage or dynamic routing technique. The second element routes the generated outflow hydrograph through the downstream valley via an implicit finite difference solution of the complete one-dimensional equations of unsteady flow. Essential input data consists of: (1) the geometrical and temporal description of the breach; (2) the reservoir depth, length, and either storage-elevation or top width-elevation tables; and (3) the Manning roughness coefficient-elevation and top width-elevation tables for the downstream valley. The model was applied to the dam-break floods which resulted from the failures of the Teton Dam and the Buffalo Creek coal-waste dam to test the model's ability to reconstitute observed downstream peak stages, discharges, and travel times. Simulation accuracy, computer requirements, input parameter sensitivies, and numerical computational characteristics were presented for each of the applications. (See also W79-01262) (Humphreys-ISWS)
W79-01270

CALCULATING AND ROUTING THE TETON DAM-BREAK FLOOD,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
W. A. Thomas.
In: Proceedings of Dam-Break Flood Routing Model Workshop; Workshop held October 18-20, 1977, Bethesda, Maryland: Hydrology Committee, United States Water Resources Council, Washington, D.C., p 198-227, October 1977. 6 tab, 2 ref, 14 plate.

Descriptors: *Dam failure, *Flood routing, *Mathematical models, *Idaho, Flood profiles, Flood waves, Peak discharge, Discharge(Water), Rivers, Reservoirs, Hydrographs, Hydrograph analysis, Analytical techniques, Analysis, Model studies, Methodology, *Teton Dam(Idaho), *Snake River(Idaho), Dam-break waves.

The generalized computer program, 'Gradually Varied Unsteady Flow Profiles,' was used to calculate the outflow hydrograph at the partially breached Teton Dam and to route that flood hydrograph downstream for a distance of 30 miles. The time of arrival of the flood wave, the time of the maximum water surface elevation, and the time of recession were calculated, as well as discharge, water surface elevations, and velocity hydrographs at intervals of about 2 miles through the 30-mile routing reach. The analysis used data such as topographic maps, aerial photography, dam description, gaged stream flows, and reservoir elevation-capacity curves, generally available in the study of the impact of a dam-break flood. Gradually varied, unsteady-flow routing techniques have the capability to calculate the outflow hydrograph at a breach as well as to route that hydrograph downstream. The peak discharge at the breach is very sensitive to the size and rate of development of the breach; however, attenuation of the flood hydrograph rapidly eliminates differences in water surface elevations as the wave moves downstream. The n-values do not significantly affect the peak water elevation except near the dam; however, time of arrival is sensitive to n-values. Variation in topography appears to be a very significant parameter in the calculation of peak flood elevations. (See also W79-01262) (Humphreys-ISWS)
W79-01271

COMPARATIVE ANALYSIS OF ROUTING TECHNIQUES FOR THE FLOODWAVE FROM A RUPTURED DAM,
California Univ., Davis. Dept. of Water Science and Civil Engineering.
T. Strelkoff, D. Schamber, and N. Katopodes.
In: Proceedings of Dam-Break Flood Routing Model Workshop; Workshop held October 18-20, 1977, Bethesda, Maryland: Hydrology Committee, United States Water Resources Council, Washington, D.C., p 228-291, October 1977. 32 fig, 31 ref. NSF ENG 73-04233 A01.

Descriptors: *Dam failure, *Model studies, *Flood waves, *Reviews, Flood routing, Water levels, Mathematical models, Analytical techniques, Hydrographs, Flood profiles, Discharge(Water), Hydraulic models, Methodology, Dimensional analysis, Bores, Rivers, Dam-break waves.

The results of 5 different approaches to the numerical modelling of flooding from a breached or ruptured dam were compared with each other and with experimental data obtained in rectangular flumes by the Army Corps of Engineers in 1960-61. Total instantaneous failure of the entire dam as well as vertical breaches comprising from 6% to 60% of the dam (and valley) width were investigated. Extremely smooth (Manning n = 0.009) and extremely rough (n approximately 0.05) boundaries were considered. Of the 5 mathematical models, 2 comprised solutions to the Saint-Venant equations: one solution was a fully second-order method of characteristics applied to specified time lines, and the other was a two-step, implicit-explicit scheme devised by Vasiliev. The results of these 2 models agreed between themselves and with much of the experimental data; and, thus, were viewed as standards against which the results of simpler models could be compared. These simpler models consisted of (1) an implicit application of integrated zero-inertia equations (Saint-Venant equations with all acceleration terms deleted) to finite elements of the floodwave; (2) a normal-depth kinematic-wave model, essentially identical to modified-Puls routing in a long, prismatic channel; (3) same as 2, but with a kinematic-shock profile fitted at the front. Results of a sixth model, fully two-dimensional in plan, were given for one of the Corps tests of a breached dam. Accuracy of the simpler schemes depends strongly on a characteristic Froude number based on reservoir depth and hypothetical normal velocity at that depth. Agreement improves with smaller breaches. (See also W79-01262) (Humphreys-ISWS)
W79-01272

QUALITATIVE COMPARISON OF THREE DAM BREAK ROUTING MODELS,
Sutron Corp., Arlington, VA.
T. N. Keefer, and R. K. Simons.
In: Proceedings of Dam-Break Flood Routing Model Workshop; Workshop held October 18-20, 1977, Bethesda, Maryland: Hydrology Committee, United States Water Resources Council, Washington, D. C., p 292-311, October 1977. 8 fig, 4 tab, 17 ref.

Descriptors: *Dam failure, *Model studies, *Flood routing, *Flood waves, Mathematical models, Hydrographs, Discharge(Water), Water levels, Peak discharge, Analytical techniques, Rivers, Open channels, Dam-break waves, Finite difference technique, Modified Puls Method, Multiple linearization technique, Uniform channels.

Hypothetical dam-break-like waves routed through 5- and 25-mile reaches of rectangular and nonrectangular channels. Routing was done by the linear implicit finite difference technique, the Modified Puls method, and the Multiple Linearization technique. The finite difference model was used as a standard of comparison. The Modified Puls method does not behave consistently with respect ot finite difference. Comparison of peak stage, peak discharge, and time of peak ranged from high to low by considerable percentages (15 or more). The Multiple Linearization method compares favorably at short distances. The model consistently predicts too great a stage and discharge and too fast travel times (10% or less). In general, the cost of gathering and preparing input data far exceeds computer cost. Thus, there seems to be little excuse for not using a finite difference model in most anayses. (See also W79-01262) (Humphreys-ISWS)
W79-01273

DAM-BREAK FLOOD WAVE COMPUTATION BY METHOD OF CHARACTERISTICS AND LINEARIZED IMPLICIT SCHEMES,
Geological Survey, NSTL Station, MS. Gulf Coast Hydroscience Center.
C-l. Chen, and L. A. Druffel.
In: Proceedings of Dam-Break Flood Routing Model Workshop; Workshop held October 18-20, 1977, Bethesda, Maryland: Hydrology Committee, United States Water Resources Council, Washington, D.C., p 312-345, October 1977. 11 fig, 28 ref.

Descriptors: *Dam failure, *Flood waves, *Mathematical models, *Flood routing, Numerical analysis, Model studies, Mathematical studies, Equations, Analytical techniques, Analysis, Rivers, Water levels, Discharge(Water), Peak discharge, Methodology, *Dam-break waves, Method of characteristics, Finite difference model.

Two numerical techniques for computing dam-break flood waves in nonprismatic channels, with or without a base flow, were investigated. One technique is to formulate an explicit scheme of the characteristics method with specified time intervals and, to use the Rankine-Hugoniot shock equations to trace one characteristic backwards to the known state for the solution of a shock wave. The other technique is to formulate a linearized implicit finite-difference scheme for the solution of the Saint-Venant equations and to compute a shock wave without resorting to the shock equations. Mathematical problems encountered in the computation using both techniques included numerical oscillations or instabilities caused by a large depth difference at the dam, severe channel expansions and contractions, large roughness variations, and singularities both at the leading edge and trailing edge of the surge on a dry bed. A comparison of results obtained from computer experiments indicated that a technique using the method of characteristics scheme works better initially after the dam break, and the other technique works better at later times. Computed data on arrival time of the leading edge of the advancing wave, peak stage, and duration of flood at several points of interest on the river reach were presented. (See also W79-01262) (Humphreys-ISWS)
W79-01274

A NUMERICAL MODEL FOR MULTIDIMENSIONAL UNCONSTRAINED FLOW OVER IRREGULAR TERRAIN,
Energy Inc. Idaho Falls, ID.
K. D. Richert.
In: Proceedings of Dam-Break Flood Routing Model Workshop; Workshop held October 18-20, 1977, Bethesda, Maryland: Hydrology Committee, United States Water Resources Council, Washington, D.C., p 346-353, October 1977. 3 fig, 4 ref.

Descriptors: *Dam failure, *Flood waves, *Numerical analysis, *Mathematical models, Model studies, Equations, Analytical techniques, Analysis, Flood routing, Rivers, Water levels, Methodology, *Teton Dam.

An extension of the MAC (Marker and Cell) method was developed to predict the transient two-dimensiona horizontal flow of water over irregular topography. Special attention was given to the treatment of the leading edge of the flood. The method utilizes a rectangular grid of cells with a totographic elevation specified for each cell. This permits the calculation of the path taken by the flood with no a priori assumptions of flood routing needed. The basic solution procedure involves the solution of a integrated continuity equation and two integrated momentum equations. The integrared equations are similar to the two-dimensional equations of a compressible fluid whose equation of state is a function of a single thermodynamic variable. The integrated continuity equation was used to solve for the height of the fluid as a function of time and positions. The use of the method was demonstrated by a calculation of the flood characteristics resulting from the Teton Dam failure. The sample problem considered the area from the dam site to Sugar City, Idaho. (See also W79-01262) (Humphreys-ISWS)
W79-01275

DAM BREAK FLOOD WAVE ANALYSIS: PROBLEMS, PITFALLS, AND PARTIAL SOLUTIONS,
Hydrocomp, Inc., Palo Alto, CA.
D. D. Franz.
In: Proceedings of Dam-Break Flood Routing Model Workshop; Workshop held October 18-20, 1977, Bethesda, Maryland: Hydrology Committee, United States Water Resources Council, Washington, D.C., p 354-383, October 1977. 6 fig, 29 ref.

Descriptors: *Dam failure, *Flood routing, *Mathematical models, Model studies, Mathematics, Unsteady flow, Analysis, Analytical techniques, Rivers, Hydrographs, Flood profiles, Water levels, Equations, Methodology, Open channels, Peak discharge, Dam-break waves.

Experiences with channel representation, outflow hydrograph estimation, and unsteady flow modeling of dam-break flood waves were related. An internally consistent and convenient channel representation for the top width, area, and first moment of area at a point in the channel was presented. This representation forms an integral part of a representation of the variation of these elements along the channel in a manner which maintains continuous space derivatives. Also outlined was a method for estimating the peak outflow subsequent to an instantaneous failure of a dam of general cross section. A consistent and accurate representation of the Escoffier stage variable forms a part of this method. Possible approaches to estimating the outflow hydrograph for reservoirs encountered in practice also were included. Experiences in the application of the diffusing scheme, the specified time interval method of characteristics, and an implicit box scheme to the modeling of dam break flood waves in non-prismatic channels were shared. Emphasis was given to consistency of approximation and special problems encountered. (See also W79-01262) (Humphreys-ISWS)
W79-01276

SIMULATION OF DAM BREAK FLOODING UNDER NORMAL AND PROBABLE MAXIMUM FLOOD CONDITIONS,
Tippett-Abbett-McCarthy-Stratton, New York.
A. Balloffet.
In: Proceedings of Dam-Break Flood Routing Model Workshop; Workshop held October 18-20, 1977, Bethesda, Maryland: Hydrology Committee, United States Water Resources Council, Washington, DC., p 384-411, October 1977. 10 fig, 8 ref.

Descriptors: *Dam failure, *Model studies, *Flood routing, *Reservoirs, Discharge(Water), Peak discharge, Hydrographs, Analytical techniques, Floods.

Mathematical models used for dam-break routing in natural channels provide adequate descriptions of their response to such massive flooding. The models described were based on a deterministic approach to the solution of the open channel equations; finite difference schemes were used. In any dam-break situation there is a background of natural flood and the increment created by the break. If the break occurs during the probable maximum, flood, the increment may be small in proportion to the natural event. When the study will result in an appraisal of the warning time for downstream population, a realistic analysis should consider a smaller flood, such as the 100-year flood, so that the flood due to the break may be compared to a normal event. Two analyses were presented for comparison of the two criteria. In both cases, explicite finite difference schemes were used for the solution downstream of the reservoir. One of the analyses was made using a 'background' flood with a 100-year return interval, while the maximum probable flood was used for the second. (See also W79-01262) (Humphreys-ISWS)
W79-01277

CRITERIA FOR ROUTING THE DAM-BREAK FLOOD,
Pacific Gas and Electric Co., San Francisco, CA.
C. B. Cecilio.
In: Proceedings of Dam-Break Flood Routing Model Workshop; Workshop held October 18-20, 1977, Bethesda, Maryland: Hydrology Committee, United States Water Resources Council, Washington, D.C., p 412-433, October 1977. 5 fig, 32 ref, 2 append.

Descriptors: *Dam failure, *Floods, *Mathematical models, *Hydrographs, Flood routing, Theoretical analysis, Hydrograph analysis, Flooding, Discharge(Water), Peak discharge, Rivers, Design criteria, Model studies, Equations, Dam-break waves.

The criteria and procedures in the analyses of hypothetical dam failures were described. The hydraulics and hydrologic concepts involved are useful tools in the planning and design of dams and embankments or siting a proposed power generating plant. This is especially true if the structure is to be located above areas of concern, such as populated cities, or if the failure of the structure can cause excessive damage to life, limb, and properties. This paper was based on experiences of Pacific Gas and Electric Company in the preparation of inundation maps from hypothetical dam failures. Criteria and procedures were described to implement the analyses and mapping in the most judicious and economical way. The method to derive the hydrograph at the failed section and subsequent routing downstream to determine the limits of probable inundation was described. Sophisticated as well as approximate methods in dam failure analyses were discussed as well as their limitation and applicability. The complexity of the work requires excellent judgment and good background in hydraulics and hydrology. Exact mathematical formulas can be attempted to simulate a postulated failure for breach sizes that are based on the engineer's experience and judgment. Therefore, it must be remembered that dam failure analysis is still a scientific art. (See also W79-01262) (Humphreys-ISWS)
W79-01278

8C. Hydraulic Machinery

BORING AND SAMPLING TECHNIQUES,
For primary bibliographic entry see Field 8G.
W79-01103

MUD AND CLAY,
Magcobar Co., Sacramento, CA.
For primary bibliographic entry see Field 8G.
W79-01120

LEGAL AND INSTITUTIONAL PLANNING FOR MACRO-CONSERVATION MEASURES,
Denver Univ., CO. Coll. of Law.
For primary bibliographic entry see Field 6E.
W79-01227

ENERGY CONSERVATION: IS THE HEAT STORAGE WELL THE KEY.,
General Electric Co., Santa Barbara, CA.
For primary bibliographic entry see Field 4B.
W79-01228

HEAT STORAGE WELLS CONSERVE FUELS,
General Electric Co., Santa Barbara, CA.
For primary bibliographic entry see Field 4B.
W79-01230

GAS-DRIVEN PUMP FOR GROUND-WATER SUPPLIES,
Geological Survey, Lubbock, TX. Water Resources Div.
D. C. Signor.
Water-Resources Investigations 78-72 (open-file report), July 1978. 25 p, 6 fig, 4 plates, 2 tab, 5 ref.

Descriptors: *Groundwater, *Water quality, *Sampling, *Methodology, *Pumps, *Specifications, Equipment, Design, Performance, *Gas-driven pump, *Small-diameter pump, Small-diameter wells.

Observation wells installed for artificial-recharge research and other wells used in different groundwater programs are frequently cased with small-diameter steel pipe. To obtain samples from these small-diameter wells in order to monitor water quality, and to calibrate solute-transport models, a small-diameter pump with unique operating characteristics is required that causes a minimum alternation of samples during field sampling. A small-diameter gas-driven pump was designed and built to obtain water samples from wells of two-inch diameter or larger. The pump is a double-piston type with the following characteristics: (1) The water sample is isolated from the operating gas, (2) no source of electricity is ncessary, (3) operation is continuous, (4) use of compressed gas is efficient, and (5) operation is reliable over extended periods of time. Principles of operation, actual operation techniques, gas-use analyses and operating experience are described. Complete working drawings and a component list are included. Recent modifications and pump construction for high-pressure applications also are described. (Woodard-USGS)
W79-01378

SELF-PROPELLED DREDGING APPARATUS,
WMI, Inc., Oklahoma City, OK. (Assignee).
R. H. Vaughn, C. E. Maitlen, G. H. Davis, and R. E. Maitlen.
U.S. Patent No. 4,095,545, 17 p, 14 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 971, no 3, p 952, June 20, 1978.

Descriptors: *Patents, *Dredging, *Equipment, Floating, Hydraulic systems, Slurries, Aquatic weeds.

A floating dredging apparatus is described which is provided with means for self-propulsion and for pumping large quantities of water and water/solid slurries. Advantages of this system include an improved dredging head mechanism which withdraws material from the bed of a body of water more efficiently and engages, chops and disposes of weeds, vegetation and other fibrous material encountered. The apparatus also has alternate means of self-propulsion and employs steerable,

water jet propulsion means for moving the apparatus for substantial distances free of the constraints of cable propulsion. (OEIS - Sinha)
W79-01389

8D. Soil Mechanics

APPROXIMATE CALCULATION OF NONSTATIONARY TEMPERATURE REGIME OF A ROCK-ICE DAM.
N. V. Ukhova.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A047-594, Price codes: A02 in paper copy, A01 in microfiche. CRREL Draft Translation 663, November 1977. 16 p, 3 fig, 9 ref. Translated from Trudy Koordinatsionnykh Soveshchanii po Gidrotekhnike, Vol. 23, p 160-172, 1965.

Descriptors: *Rockfill dams, *Ice, *Permafrost, *Dam foundations, Temperature, Thermal properties, Thawing, Freezing, Structures, Hydraulic structures, Dams, Cold regions, Cold weather construction, Earth dams, *USSR, Frozen dams, Rock-ice dams.

These Studies concern development of principles for calculating nonstationary temperature regimes of rock-ice dams. (Sims-ISWS).
W79-01049

ORGANIZATION OF FULL-SCALE ANALYSES OF FILTRATION-THERMAL REGIME OF TAILINGS DAMS ON PERMAFROST FOUNDATIONS,
G. M. Sheynfeldt.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A041-432, Price codes: A02 in paper copy, A01 in microfiche. CRREL Draft Translation 626, July 1977. 12 p, 6 fig, 1 tab. Translated from Russian.

Descriptors: *Permafrost, *Arctic, *Dams, *Dam foundations, Waste dumps, Mine wastes, Mining, Filtration, Cold regions, Cold weather construction, Thermal properties, Sediments, Temperature, Piezometers, Piezometry, Construction, Structures, Earth dams, *USSR, Tailings dams, Tailings dumps.

The planning and operation of tailings dump dams under arctic conditions have been carried out until the present time without standard documents or recommendations that consider the specific features of the climatic and permafrost conditions. This report presented an analysis of several tailings dump dams located in severe climates as well as a discussion of the use of piezometers. The conclusions presented substantially justify calculation-theoretical forecasting of the formation of the temperature mode of the tailings sediment and dam foundation. (Sims-ISWS)
W79-01050

TAILINGS COFFERDAMS ON PERMAFROST FOUNDATIONS IN YAKUTSKAYA ASSR,
G. I. Kuznetsov, and S. V. Zaslavskiy.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A041 254, Price codes A02 in paper copy, A01 in microfiche. CRREL Draft Translation 629, July 1977. 10 p, 6 fig, 1 tab. Translated from Russian.

Descriptors: *Cofferdams, *Permafrost, *Dam foundations, Filtration, Seepage, Thawing, Temperature, Waste dumps, Mine wastes, Cold regions, Cold weather construction, Construction, Dams, Structures, Earth dams, *USSR, Tailings dams, Tailings dumps.

This report provided an analysis of problems of the design, construction, and operation of tailings dumps on permafrost foundations. Analysis of data from engineering surveys, planning documents, and features of the operation of tailings dumps provided an opportunity to evaluate the permafrost-geomineralogical features of the foundations of dams. (Sims-ISWS)
W79-01051

A PROBABILISTIC ANALYSIS OF EMBANKMENT STABILITY PROBLEMS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Soils and Pavements Lab.
L. W. Gilbert.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A043 579, Price codes: A08 in paper copy, A01 in microfiche. Miscellaneous Paper S-77-10, July 1977. 152 p, 36 fig, 6 tab, 36 ref, 1 append.

Descriptors: *Embankments, *Bank stability, *Soil strength, *Model studies, Mathematical models, Probability, Stability, Soils, Clays, Levees, Flood control, Analytical techniques, Engineering, Civil engineering, Soil science, Soil mechanics.

A probabilistic model was developed to predict the reliability of an embankment constructed on soft saturated clay. The model was based on a circular arc method of analysis, supplemented with a measure of the uncertainty in the resisting and in the overturning moments. The uncertainty in the overturning moment was considered negligible. The uncertainty in the resisting moment was considered due to the uncertainities of bias, random testing error, and inherent soil variability. Two case studies were analyzed by both the conventional method of analysis and the probability model. The results indicated that the uncertainties in bias correction factors ae the dominant sources for both field vane testing and unconfined compression testing. The basic probability model was extended to include the effect of embankment length on the computed failure probability. Two approaches were taken. The first was a direct extension of the basic model, considering the actual embankment length as a multiple of the minimum embankment length required to satisfy the assumption of 'plane strain.' The second approach was a three-dimensional probability model developed from a first passage failure criterion. (Sims-ISWS)
W79-01054

8E. Rock Mechanics and Geology

CROPS-WIDE CONFERENCE ON COMPUTER-AIDED DESIGN IN STRUCTURAL ENGINEERING, VOLUME XI: EARTHQUAKE AND DYNAMIC ANALYSES,
Army Engineer Div. Huntsville, AL. Civil Structures Branch.
For primary bibliographic entry see Field 8G.
W79-01057

8G. Materials

FIRST INSPECTIONS HIGHLIGHT US DAMS THREAT.
World Water, Vol. 1, No. 2, p 19-22, June 1978. 5 fig.

Descriptors: *Dams, *Dam failure, *Inspection, Hazards, Safety, Flooding, Legal aspects, Disasters, Failures, Structures, Hydraulic structures, Impoundments, Washouts, Engineering, Civil engineering, *Dam inspections.

In the first 5 nonths of 1978, 11 American reservoirs have been hurriedly emptied becasuse the dams impounding them have been declared dangerously defective and their failure would result in the loss of 'more than a few lives and extensive property damage. Another 29 so-called 'high hazard' dams have been condemned as unsafe by engineers carrying out nationwide inspections--almost 6 years after they were ordered to do so by Congress. In each case, the dams were being inspected for the first time in many years, most of them for the first time ever. Alarming though these statistics may seem, most observers are convinced that they are only the tip of an iceberg, and that when the Corps of Engineers finishes its first-phase inspections of the nation's 9,000 high-hazard dams in 5 years (only 592 inspctions had been started by the end of May), several hundreds will face huge repair of replacement costs to remove the risk of disastrous failure. There is also a high statistical probability that a number will fail before the inspectors arrive (America has had more than 100 major dam failures since 1930). (Sims-ISWS)
W79-01048

CROPS-WIDE CONFERENCE ON COMPUTER-AIDED DESIGN IN STRUCTURAL ENGINEERING, VOLUME XI: EARTHQUAKE AND DYNAMIC ANALYSES,
Army Engineer Div. Huntsville, AL. Civil Structures Branch.
M. M. Dembo, and L. G. Guthrie.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A031 253, Price codes: A04 in paper copy, A01 in microfiche. Volume 11 of the Proceedings of a Conference held September 22-26, 1975, New Orleans, Louisiana. Army Waterways Experiment Station, Vicksburg, Mississippi, August 1976. 65 p, 20 fig, 9 ref, 4 append.

Descriptors: *Earthquake engineering, *Earthquakes, *Dynamics, Structures, Engineering structures, Buildings, Dams, Hydraulic structures, Structural engineering, Structural stability, Structural behavior, Structural analysis, Civil engineering, Computers, Computer models, Design, Structural design, Conferences, *Computer-aided design.

Two papers were contained in this volume: Earthquake and Dynamic Analysis for Military Structures - The relation between the lateral force design procedures presented in 'Seismic Design for Buildings' (TM 5-809-10) and those of more rigorous dynamic analyses were presented. For the bulk of military structures, i.e., low, one- to three-story buildings, the design procedures given in the TM are valid. The limitations on the use of the TM and other similar codes were presented, particularly where functional considerations of the building are important. Trends in development of procedures for seismic design of buildings were discussed with emphasis on the response spectrum method. State-of-the-Corps Art in Earthquake and Dynamic Analyses for Civil Works Structures - The conventional seismic coefficient method for the seismic design of concrete gravity dams is being supplemented by procedures coupling the computed dynamic response of the structure with the estimated future ground motion for the area. At present, both methods should be used to check the designs of new and existing hydraulic structures in high risk seismic zones. So far, precise standards have not been established for designating design earthquakes for an area or for defining the requirements for a structure's dynamic performance. This paper reviewed the present earthquake design procedures, which involve computing inertial, hydrodynamic, and dynamic earth forces. (Sims-ISWS)
W79-01057

BORING AND SAMPLING TECHNIQUES,
P. H. Nowlan.
Drilling News, Vol. 3, No. 2, p 17-25, Winter, 1978. 3 ref, 2 append.

Descriptors: *Drilling, *Boreholes, *Sampling, *Cores, Rotary drilling, Auger drilling, Wash boring, Samplers.

Boring methods are grouped into two categories, destructive and non-destructive. Destructive methods include: rotary percussion, auger, and wash-boring. Rotary core drilling is the only non-destructive method. Variations of the destructive methods along with their applications, advantages, and limitations are discussed in detail. Rotary core drilling is used for the collection of accurate data rather than drilling holes quickly and economically. Core samples from good rock are relatively undisturbed samples. Disturbed samples, obtained a products of destructive drilling methods, are suitable only for strata identification. Distortion and contamination of samples are caused by difficult sampling conditions, and lack of preservation and

handling precautions. Three samples: the Shelby thin wall tube sampler, the stationary piston sampler, and the Denison sampler are described and the applications and advantages of each are listed. The common feature of all three samplers is that they all recover a sample by pushing a thin tube into cohesive soil. Proper operation procedures for sampling various types of material are discussed. Data needed to be recorded during the drilling of rotary percussion holes is listed and common core barrel, core and casing sizes are tabulated. (Purdin-NWWA)
W79-01103

FLUID DEVELOPMENT FOR DRILLING SLOUGHING AND HEAVING SHALES,
Amoco Production Co., Tulsa, OK.
D. B. Anderson, and C. D. Edwards.
Petroleum Engineer, Vol. 49, p 105-116, September, 1977. 7 tab.

Descriptors: *Drilling fluids, *Shales, Hydraulics, *Stabilization, Inhibition, Salts, Coatings, Rolling tests, Methylene blue test, Gilsonite.

Rolling tests were developed to simulate exposure of shales to various additives and mud systems. Shales were classified by measuring cation exchange capacity using a methylene blue test (MBT). Factors to consider in developing a fluid for sloughing shale include: drilling fluid properties, hydraulics, time of exposure, and formation being drilled. The best material for preventing shale disintegration is flaxmeal. Various salts were found to improve initial shale recovery. As salt content increases, viscosity also increases and fluid loss decreases. If inhibiting salts are added to coating agents, hydration and swelling decrease. There is a minimum amount of potassium ions and a minimum ratio of potassium ion to sodium ion required for maximum shale stability. Reactivity of shale as measured by the MBT can be used to detemine whether a coating agent or an inorganic salt is more important for stability. Gilsonite aids shale stability with its high softening point (400 degrees F) and its chemical attraction to shale solids. Samples of shales from various parts of the world were examined to determine the validity of the conclusions made from rolling tests. (Purdin-NWWA)
W79-01104

SCALING AND CORROSION IN AN EXPERIMENTAL GEOTHERMAL POWER PLANTS,
San Diego Gas and Electric Co., CA.
For primary bibliographic entry see Field 3C.
W79-01106

FIELD PERMEABILITY METHODS FOR IN-PLACE LEACHING,
Bureau of Mines, Twin Cities, MN. Twin Cities Mining Research Center.
For primary bibliographic entry see Field 2F.
W79-01111

A LOOK AT RPM PLASTIC,
Water Well Journal, Vol. 30, No. 11, p 79-80, November, 1978. 1 tab.

Descriptors: *Plastic pipes, *Well casings, Wells, Installation, Corrosion, Reinforcement.

Reinforced plastic motar (RPM) well casing has been used in water wells where corrosion resistance, long service life and larger diameters are required. It is also ideal for ground water monitoring wells and injecton wells. RPM casings are available in a variety of ring stiffness combinations, with varying hoop and axial strengths to withstand the strain of installation and subsurface conditions up to 1000 feet. RPM tension well casing has a high axial tensile strength and a low-profile locking key joint. Tension casing differs from compression casing in that its wall has greater axial glass additions and it is easier to install. Neither compression nor tension casing require cement grouting. However, most wells should be cemented, grouted, or sealed to protect the supply against pollutions. (Purdin-NWWA)
W79-01114

MUD AND CLAY,
Magcobar Co., Sacramento, CA.
C. Ruggles.
Pacific Grandwater Digest, Vol. 1, No. 1, p 11-12, September, 1978.

Descriptors: *Drilling fluids, *Clays, *Rotary drilling, Erosion control, Protective coatings, Filter cakes, Circulation loss, Additives, Gels, Cements, Drilling.

The purpose of clay in the drilling industry is to carry cuttings, reduce hole erosion, reduce fluid loss to the formation, and deposit a filter cake. The amount of clay needed to carry cuttings varies with the pump output. To stop hole erosion, either increase the clay thickness or decrease pump output or both. The purpose of the wall cake is to lower fluid loss and help support loose sands. Too thick a cake results in sticky holes and low production. Thick filter cakes are due to weight climb as a result of not removing cuttings. They can also be caused by lime, salt, excessively hard water and cold temperatures. Lime, salt and hard water can be corrected with a fluid loss additive like Kwik Drill or Soda Ash. Gel diesel fuel 2 and occasionally cement can be used to stop lost circulation. Gel is also used when cementing off blow holes, sloughed sand zones, etc. Gel should be mixed in a hopper with a 1/2-inch nozzle or jet. Feed the hopper with gel at a rate of 25 lb. per minute and at a pump pressure over 300 psi. (Purdin-NWWA)
W79-01120

HIGH-TEMPERATURE SOLUBILITIES OF CALCIUM SULFATE HEMIHYDRATE AND ANHYDRITE IN NATURAL SEAWATER CONCENTRATES,
California Univ., Los Angeles. School of Engineering and Applied Science.
For primary bibliographic entry see Field 3A.
W79-01128

POTENTIODYNAMIC STUDIES OF ANTIMONY IN ACIDIC AND ALKALINE SOLUTIONS,
California Univ., Los Angeles. School of Engineering and Applied Science.
L. L. Wikstrom, and K. Nobe.
Corrosion, Vol 31, No. 10, p 364-369, October 1975. 14 fig, 6 ref, (California Water Resources Center Seawater Desalination Program).

Descriptors: *Corrosion, *Polarization, Desalination, *Antimony, Acidic solution, Alkaline solutions.

Potentiodynamic polarization of antimony in acidic and alkaline solutions had been investigated. In acidic solutions, two transition potentials were observed at about the equilibrium potentials of the Sb/Sb203 and the Sb203/Sb205 reactions. Both anodic ad cathodic Tafel behavior was observed for these reactions. The anodic ad cathodic Tafel slopes are 100 and 150 mV/decade, respectively, for the Sb203/Sb205 reaction. For the latter, the cathodic reaction is first order and the anodic reaction is zero order with respect to the hydrogen ion concentration. A mechanism for the Sb203/Sb205 reaction is proposed which is consistent with the experimental kinetic data. In alkaline solutions, only the Sb/Sb203 reaction was observed. In both acidic and alkaline solutions the differential capacitance of active antimony is substantially larger than the differential capacitance of passive antimony. (Snyder- Calif, Davis)
W79-01232

POLARIZATION AND PHOTOPOTENTIALS OF INSB IN NAOH,
California Univ., Los Angeles. School of Engineering and Applied Science.
R. E. Patterson, D. A. Chance, and K. Nobe.
Corrosion, Vol. 31, No. 7, p 243-246. July 1975, 10 fig, 10 ref, (California Water Resources Center Desalination Project S-144).

Descriptors: *Corrosion, *Anodes, *Polarization, Desalination, Antimony, *Photopotentials.

The anodic dissolution of the (111)-Sb surface in 1N NaOH was at a slightly higher rate compared to the (111)-In surface. On the other hand, the rate of hydrogen evolution was slightly higher on (111)-In than on (111)-Sb. Anodic dissolution was not affected by illumination prior to passivation. However, photopotentials as high as 0.1 V were observed after the InSb was anodized at passivating currents. The magnitude of the photopotentials decreased during the potential decay after anodization was completed. The spectral response of the photopotentials after attainment of steady state corrosion potentials was determined. The differential capacitance at the corrosion potential prior to anodization was 35 uF/cm2. Immediately after anodization, the capacitance was 0.6 uF/cm2 and then increased to about 2.2 uF/cm2 at the end of the potential decay. Both the photopotentials and small capacitance values were due to the film formed during anodization. (Snyder- Calif, Davis)
W79-01233

ELECTRODISSOLUTION OF NICKEL IN MOLTEN LICL-KC1,
California Univ., Los Angeles. School of Engineering and Applied Science.
D. L. Piron, S. Asakura, and K. Nobe.
Journal of the Electrochemical Society, Vol. 123, No. 4, p 503-506, April 1976. 8 fig, 8 ref. (California Water Resources Center Seawater Desalination Program).

Descriptors: *Saline water, *Corrosion, *Molten salts, Anodic dissolution, Desalination, *Nickel, Chloride compounds, Diffusion coefficients.

The electrodissolution of nickel in molten eutectic LiC1-KC1 has been investigated by quasi-steady-state potentiostatic and transient polarization techniques. The results indicate that electrodissolution is diffusion controlled. In addition, anodic passivation behavior is observed. Passivation is surmised to be due to the deposition of a chloro-nickel complex. Diffusion coefficients of Ni(II) have been determined from the chronoamperometric and chronopotentiometric data and found in accord with values reported in the literature. (Snyderf-Calif, Davis)
W79-01234

HYDROGEN EVOLUTION AND CORROSION BEHAVIOR OF FE-NI ALLOYS IN H2SO4 - EFFECT OF TEMPERATURE, C1- AND BENZATRIAZOLE,
California Univ., Los Angeles. School of Engineering and Applied Science.
D. Altura, and K. Nobe.
Corrosion, Vol. 32, No. 2, p 41-47, February 1976. 14 fig, 3 tab, 19 ref. (California Water Resources Center Seawater Desalination Project).

Descriptors: *Corrosion, *Alloys, *Polarization, Desalination, Hydrogen sulfide, Temperature, Chloride ions, Benzatriazole, *Iron-nickel alloys.

The corrosion of iron-nickel alloys in deaerated 1N H2SO4 in the absence and presence of chloride ions and benzotriazole (BTA) between 23 to 75C has been investigated. A marked decrease in the corrosion rate of the uninhibited alloys in the absence and presence of chloride ions was observed as the iron content decreased from pure iron to 60% Fe at all temperatures. On the other hand, below 60% Fe the corrosion rate of the alloys did not differ as substantially. Apparent activation energies for corrosion of Fe-Ni alloys in 1 N H2SO4 decrease with increase in nickel content. Benzotriazole was an effective corrosion inhibitor of the Fe-Ni alloys in 1N H2SO4 even at 75C. (Snyder-Calif, Davis)
W79-01235

ELECTROCHEMICAL BEHAVIOR OF ROTATING IRON DISKS EFFECT OF FE(111),

California Univ., Los Angeles. School of Engineering and Applied Science.
R. F. Tobias, and K. Nobe.
Journal of Electrochemical Society: Electrochemical Science and Technology Vol. 122, No. 1, p. 65-70. January 1975, 12 fig, 2 tab, 10 ref. (California Water Resource Center Desalination Project S-144).

Descriptors: *Corrosion, *Polarization, *Diffusion, Coefficients, Electrochemistry, *Iron, Ions.

The electrochemical behavior of iron in deaerated H2SO4 containing ferric ions has been investigated with rotating disk electrodes. The rest potential and corrosion current of iron in IN H2SO4 were not affected by variation in the angular velocity. On the other hand, the rest potential, E(m), and corrosion current of iron in 1N H2SO4 containing ferric ions varied with the ferric ion concentration, C, and the angular velocity of the iron disk, m. Em followed the relation Em = constant + 0.040 log C + 0.020 log m, volts The corrosion current of iron increased in the presence of ferric ions and was controlled by the diffusion of ferric ions. Diffusion coefficients of ferric and ferrous ions were determined: DFe(111) = 5.2+0.3X10-6 and DFe(11)=6.5+0.4X10-6 cm2/sec. (Snyder-Calif, Davis)
W79-01281

METHOD FOR SEQUESTERING METAL IONS,
Benckiser-Knapsack G.m.b.H., Ladenburg am Neckar (West Germany) (Assignee).
For primary bibliographic entry see Field 5G.
W79-01417

8I. Fisheries Engineering

FISH LADDER FOR CHARLES RIVER DAM, CHARLES RIVER, MASSACHUSETTS, HYDRAULIC MODEL INVESTIGATION,
Army Engineer Div. North Pacific, Bonneville, OR. Div. Hydraulic Lab.
L. Z. Perkins, and P. M. Smith.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A048 184, Price codes: A05 in paper copy, A01 in microfiche. Technical Report No. 157-1, December 1977. 62 p, 38 fig, 1 tab.

Descriptors: *Fish ladders, *Dams, *Model studies, *Hydraulic models, Hydraulic structures, Weirs, Fish passages, Fish handling facilities, Fish management, Fish migration, Rivers, Flow, Laboratory tests, Hydraulic engineering, *Charles River(Mass).

The design of a fish ladder that would operate with downstream tide fluctuations of 14 ft and upstream river fluctuations of 1 ft were developed in two hydraulic models. The hydraulic design of the ladder was developed in a 1:8-scale model. Hydraulic characteristics of a false weir at the upstream end of the ladder were studied in a 1:4-scale model. The ladder was intended to pass primarily shad and alewives. The initial fish ladder was of the vertical-slot type, with 29 pools and a false weir above high tide level to lead fish into a steep chute to the river 6.5 ft below. The design was hydraulically satisfactory. The design was modified to include a direct swim-through exit to the river for use during low and intermediate tides. The low tide ladder section consisted of 5 pools, with notched weirs and a weir gate exit. The false weir exit was designed to operate with all tide levels, but fish were to be blocked from that section by a barrier rack during use of the low tide exit. In a further modification, the notched weirs of the low tide section were replaced with a submerged screen barrier that would force fish toward the surface for better public viewing. With that plan, the false weir exit operated only when the low tide exit was closed. All the plans were satisfactory. The plan with a false weir exit and a low tide exit with submerged barrier screen was selected for construction. (Sims-ISWS)
W79-01052

9. MANPOWER, GRANTS AND FACILITIES

9D. Grants, Contracts, and Research Act Allotments

HOW TO OBTAIN FEDERAL GRANTS TO BUILD MUNICIPAL WASTEWATER TREATMENT WORKS.
Environmental Protection Agency, Washington, DC. Municipal Construction Div.
For primary bibliographic entry see Field 5G.
W79-01210

10. SCIENTIFIC AND TECHNICAL INFORMATION

10F. Preparation Of Reviews

PROCEEDINGS OF DAM-BREAK FLOOD ROUTING MODEL WORKSHOP.
Water Resources Council, Washington, DC. Task Force on Dam-Break Flood Routing.
For primary bibliographic entry see Field 8B.
W79-01262

SUBJECT INDEX

ABSORPTION
Uptake of Zinc by the Aquatic Larvae of Simulium Ornatipes (Diptera: Newatocera),
W79-01026 5C

Total Mercury and Methyl Mercury Contents in Fish from Lake Paijanne,
W79-01028 5C

Hydrogen Recovery from Purge Gas of Ammonia Plants,
W79-01067 5D

Relation of Water Absorption to Duration of Application in Furrow Irrigation,
W79-01094 3F

ACID MINE WATER
Effect of Acid Mine Drainage on the pH of Lake Toya, Japan,
W79-01258 5B

ACID PRECIPITATION
Can Salamanders and Frogs Survive the Threat of Acid Precipitation,
W79-01005 5C

ACID TREATMENT
Exceptional Tolerance to Low pH of some Tropical Blackwater Fish,
W79-01098 5C

ACIDIC SOILS
Electron Spin Resonance Analysis of Semiquinone Free Radicals of Aquatic and Soil Fulvic and Humic Acids,
W79-01133 5A

ACIDS
The Slope of Gran's Plot: A Useful Function in the Examination of Precipitation, the Water-Soluble Part of Airborne Particles, and Lake Water,
W79-01474 5A

ACOUSTICS
Acoustic Doppler Sounding of Falling Snow,
W79-01034 2C

ACTIVATED CARBON
Application of Packed Biopolar Cell to Electrolytic Treatment of Waste Waters, (In Japanese),
W79-01080 5D

Bio-regeneration of Hydrocarbon-Exhausted Activated Carbon.
W79-01093 5D

Treatment and Disposal of Complex Industrial Wastes,
W79-01321 5D

ACTIVATED SLUDGE
Wastewater Problems in the Food Processing Industry in the Light of Modern Water Management (Az elelmiszeripar szenny viz-problemai a korszeru vizgazdalkodas tukreben),
W79-01071 5D

Wastewater Treatment in the Sugar Industry (II) (Abwasseraufbereitung der Zuckerwarenindustrie (II)).
W79-01072 5D

Effect of Copper and Tri- and Hexavalent Chromium on the Work of an Activated Sludge,
W79-01079 5D

Differential Bed Kinetic Analysis of Heavy Metal Removals by Biological Slimes,
W79-01314 5D

Method of Treating Waste Water with Activated Sludge,
W79-01403 5D

ADJUDICATION PROCEDURE
Bond Street and Weatherbest Slip Boathouse Owners V. City of North Tonawanda (City may not Terminate Water Service to a Customer in Good Standing).
W79-01187 6E

ADMINISTRATIVE AGENCIES
The Fox in the Chicken Coop: The Regulatory Program of the U.S. Army Corps of Engineers,
W79-01141 6E

ADMINISTRATIVE DECISIONS
Matter of the Waters of Long Valley Creek System (Prospective Riparian Rights Cannot be Denied or Quantified by State Water Resources Board),
W79-01184 6E

ADSORPTION
Uptake and Release of Petroleum by Intertidal Sediments at Port Valdez, Alaska,
W79-01022 5B

Effects of Chromium on Some Aquatic Plants,
W79-01031 5C

Hydrogen Recovery from Purge Gas of Ammonia Plants,
W79-01067 5D

Treatment and Disposal of Complex Industrial Wastes,
W79-01321 5D

Ultrastructure of the Blue-Green Alga Anacystis Nidulans Infected with AS-1 Virus,
W79-01334 5C

AEROBIC DIGESTION
Nitrogen and Phosphorus Behavior During Aerobic Digestion of Waste Activated Sludge,
W79-01003 5D

AEROBIC TREATMENT
A Study for Improving the Aerobic-Media Trickling Filter for Wastewater Treatment,
W79-01123 5D

AGGREGATED OXISOL
Field Study of Solute Movement in a Highly Aggregated Oxisol with Intermittent Flooding: I. Nitrate,
W79-01360 3F

AGRICULTURAL WATERSHEDS
Optimal Operation of Large Agricultural Watersheds with Water Quality Constraints,
W79-01355 4D

AIR POLLUTION
Role of Turbulent Mixing in the Dispersion of Pollutants at the Edge of a Large Lake,
W79-01199 5C

AIR POLLUTION EFFECTS
Can Salamanders and Frogs Survive the Threat of Acid Precipitation,
W79-01005 5C

ALASKA
Uptake and Release of Petroleum by Intertidal Sediments at Port Valdez, Alaska,
W79-01022 5B

Inclusion of Alaska Lands in National Park, Forest, Wildlife Refuge, and Wild and Scenic Rivers Systems (Part II, Washington, D.C.).
W79-01177 6E

Inclusion of Alaska Lands in Natl. Park, Forest, Wildlife Refuge, and Wild and Scenic Rivers Systems (Part V, Atlanta, GA.).
W79-01178 6E

Inclusion of Alaska Lands in Natl. Park, Forest Wildlife Refuge and Wild and Scenic Rivers Systems (Part XII, Fairbanks, Alaska).
W79-01179 6E

Inclusion of Alaska Lands in National Park, Forest, Wildlife Refuge, and Wild Scenic Rivers Systems (Part XIII, Alaska Town Meetings),
W79-01180 6E

Hydrocarbons in the Marine Environment of Port Valdex, Alaska,
W79-01254 5B

A Preliminary Survey of the Zooplankton and Benthos of an Arctic Lake Near Prudhoe Bay, Alaska,
W79-01427 2H

Effects of Industrial Wastewater Effluents on Water Quality in Gibson Cove and Kodiak Harbor, Kodiak, Alaska, August 26-29, 1974.
W79-01437 5C

ALCOHOLS
Effect of Dibasol and Vitamin B12 on the Larvae of Aurelia Aurita (Soyphozoa) in a Reduced Saline Medium,
W79-01451 5C

ALDRIN
Chlorinated Hydrocarbons and Mercury in Aquatic Vascular Plants of Lake Paijanne, Finland,
W79-01029 5C

ALFALFA
Corn and Alfalfa Production as Influenced by Irrigation and Salinity,
W79-01136 3C

ALGAE
Effects of Chromium on Some Aquatic Plants,
W79-01031 5C

A Bioassay Technique to Evaluate the Effect of Secondary Effluent on Algal Interactions in the Connecticut River,
W79-01089 5C

Calcification and Its Role Among the Macroalgae,
W79-01097 2I

Observations on Algal Populations and Experimental Maturation Pond System,
W79-01196 5D

Additions to the Freshwater Algae of South Carolina,
W79-01203 5C

The Dewatering of Lime-Algae Sludge on Sand Drying Beds,
W79-01349 5D

Mortalities of Pen-Reared Salmon Associated with Blooms of Marine Algae,
W79-01462 5C

ALGAECIDES
Algaecidal Composition,
W79-01401 5F

ALGORITHMS
Parameter Identification in an Inhomogeneous Medium with Finite Element Method,
W79-01341 2F

ALKALIS (BASES)
Laboratory Investigation of Water Pollution by Organic Substances in Flax Wastes Delignification (Laboratorne sledovanie organickeho znecistenia vod pri delignifikacii lanovych odpadov),
W79-01085 5B

ALLOYS
Hydrogen Evolution and Corrosion Behavior of Fe-Ni Alloys in H2SO4 - Effect of Temperature, Cl- and Benzatriazole,
W79-01235 8G

ALTERNATIVE PLANNING
Impact of Floods and Alternative Flood Control Measures on the Devils Lake Basin Economy,
W79-01122 6B

Public Involvement in Natural Resource Development: A Review of Water Resource Planning,
W79-01153 6B

The Tennessee Valley Authority's Tellico Dam Project-Costs, Alternatives, and Benefits.
W79-01193 6B

Economic Analysis of Alternative Sludge Disposal Methods in Vermont,
W79-01328 5E

Population Growth and Socio-Economic Balance: How to Visualize Alternative Futures,
W79-01485 6B

An Economic Evaluation of Cropland Use as a Control for Sediment Nonpoint Pollution,
W79-01498 5G

ALUMINUM
Comparison of Iron (III) and Aluminum in Precipitation of Phosphate from Solution,
W79-01095 5D

AMBERLITE XAD-2 RESIN
Recovery of Nitrosamines from Water,
W79-01006 5D

AMERICAN COOTS
Waterfowl Collisions with Power Lines at a Coal-Fired Power Plant,
W79-01434 6G

AMERICAN SHAD
Trends in the Abundance of American Shad, Alosa Sapidissima, in the Delaware River Basin,
W79-01322 5C

AMMONIA
Hydrogen Recovery from Purge Gas of Ammonia Plants,
W79-01067 5D

Extraction of Ammonium Ions from Wastewaters Generated in the Production of Compound Fertilizers and Their Utilization by Ion-Exchange Method (Izvlechenie ionov ammoniya iz stochnykh vod proizvodsty slozhnykh udobrenii ikh utilizatsiya metodom ionnogo obmena),
W79-01068 5D

Oxidation-Reduction Chemistry And Aqueous Ammonium Oxidation in the Estimation of Nitrate by the Cadmium Reduction Method,
W79-01100 5B

Observations on Algal Populations and Experimental Maturation Pond System,
W79-01196 5D

Growth and Resource Allocation Responses of Spartina Alterniflora Loisel to Three Levels of NH sub 4-N, FE, and NACL in Solution Culture,
W79-01294 2I

Evaluation of Clinoptilolite for Ammonia Removal,
W79-01464 5D

Ammonia Production Rate and its Application to Fish Culture System Planning and Design,
W79-01465 5C

AMMONIUM OXIDATION
Oxidation-Reduction Chemistry And Aqueous Ammonium Oxidation in the Estimation of Nitrate by the Cadmium Reduction Method,
W79-01100 5B

ANACYSTIS NIDULANS
Ultrastructure of the Blue-Green Alga Anacystis Nidulans Infected with AS-1 Virus,
W79-01334 5C

ANAEROBIC BACTERIA
On the Mechanisms of CO2 and CH4 Production in Natural Anaerobic Environments,
W79-01135 5C

ANAEROBIC CONDITIONS
Sewage from the Yeast Industry: Its Nature and Its Purification (Abwasser der Hefeindustrie, Beschaffenheit und Reinigung),
W79-01075 5D

ANALYSIS
A Comparison of Bethlehem Steel Corp V. Train with Republic Steel Corp. V. Train: The Sixth Circuit,
W79-01162 5G

ANALYTICAL TECHNIQUES
Precision Analysis for Waterborne Chrysotile Asbestos by Transmission Electron Microscopy,
W79-01010 5A

The Density of Seawater Solutions at One Atmosphere as a Function of Temperature and Salinity,
W79-01064 2K

Determination of the Bichromate Oxidizability of Sugar Factory Effluents (Opredelenie bikhromatnoy okislyaemosti stochnykh vod sakharnogo zavoda),
W79-01074 5A

Analysis of Economic Effect of Environmental Regulations on Integrated Iron and Steel Industry. Volume II,
W79-01194 5G

Floods from Breaching of Dams,
W79-01267 8B

Evaluation of Micromolar Complexiметric Titrations for the Determination of the Complexing Capacity of Natural Waters,
W79-01344 5A

Determination of the Complexing Capacity of Natural Water by Cobalt (III) Complexation,
W79-01345 5A

An Automated Procedure for the Simultaneous Determination of Specific Conductance and pH in Natural Water Samples,
W79-01374 2K

Lag Adjustment Between Estimated and Actual Physiological Responses Conducted in Flow-Through Systems,
W79-01445 5C

The Slope of Gran's Plot: A Useful Function in the Examination of Precipitation, the Water-Soluble Part of Airborne Particles, and Lake Water,
W79-01474 5A

Use of Unicellular Algae for Evaluation of Potential Aquatic Contaminants,
W79-01476 5A

ANIMAL BEHAVIOR
The Toxic Effects of the Water Soluble Fractions of No. 2 Fuel Oil and Three Aromatic Hydrocarbons on the Behavior and Survival of Barnacle Larvae,
W79-01025 5C

Great Blue Herons Respond to Nesting Habitat Loss,
W79-01432 6G

ANIMAL PHYSIOLOGY
Shell Structure of Immature Roman Snails (Helix Pomatia) After Exposure to P,P'-DDT,
W79-01020 5C

In Vitro Changes in the Activity of ATPases in the Gills of Carcinus Maenas Exposed to Various Concentrations of p,p'-DDT,
W79-01032 5C

ANIMAL POPULATIONS
Characteristics of Small Mammal Populations in Forested and Old Field Habitats Prior to Effluent Spray Irrigation,
W79-01331 5C

ANIMAL WASTES (WILDLIFE)
Gull Droppings and Their Effects on Water Quality,
W79-01041 5B

ANION EXCHANGE
Quantitative Determination of Quaternary Ammonium Bases (QAB) in Water and Wastewater by Thin Layer Chromatography,
W79-01070 5A

ANODES
Fixed-Bed Electrolysis - A Process for Purifying Waste Water Contaminated with Metals (Festbettelektrolyse - ein Verfahren zur Reinigung metallhaltiger Abwasser),
W79-01081 5D

Polarization and Photopotentials of InSb in NaOH,
W79-01233 8G

ANODIC STRIPPING VOLTAMMETRY
Evaluation of Micromolar Complexiметric Titrations for the Determination of the Complexing Capacity of Natural Waters,
W79-01344 5A

ANTIBACTERIAL SUBSTANCES
Polyhalogenated 1l-Octene-3-Ones, Antibacterial Metabolites from the Red Seaweed Bonnemaisonia Asparagoides,
W79-01204 5C

ANTIMONY
Potentiodynamic Studies of Antimony in Acidic and Alkaline Solutions,
W79-01232 8G

APPLICATION EQUIPMENT
Adjustable Height Sprinkler,
W79-01411 3F

APPLICATION RATES
Relation of Water Absorption to Duration of Application in Furrow Irrigation,
W79-01094 3F

APPROXIMATION METHOD
Simplified Routing through Reservoir,
W79-01266 4A

AQUACULTURE
Suspension-Feeding Aquaculture Systems: Effects of Phytoplankton Concentration and Temperature on Growth of the Bay Scallop,
W79-01285 5C

AQUATIC ALGAE
Effect of Complexation by Natural Organic Ligands on the Toxicity of Copper to a Unicellular Alga, Monochrysis Lutheri,
W79-01449 5C

AQUATIC HABITATS
Hydrologic Impact of Land Drainage on Estuaries,
W79-01385 4A

AQUATIC INSECTS
Chlorinated Hydrocarbons in Marine Insects,
W79-01023 5B

Pre-Management Assessment of Aquatic Macroinvertebrates in a Small, Sedimentary Drainage Area of the Maumee and Lake Erie Basin.
W79-01096 5C

Aspects of the Life History and Growth of Acroneuria (Calineuria) Californica in a Sierra Foothill Stream,
W79-01125 2I

AQUATIC MACROPHYTE
Phosphorus Cycling in Nuphar luteum Communities in the Lower Chowan River, North Carolina,
W79-01326 5C

AQUATIC MICROORGANISMS
Biological Control Agents of Sewage Bacteria in Marine Habitats,
W79-01027 5C

AQUATIC PLANTS
Primary Production in a Shallow Water Lake with Special Reference to a Reed Swamp,
W79-01223 5C

Phosphorus Cycling in Nuphar luteum Communities in the Lower Chowan River, North Carolina,
W79-01326 5C

Seasonal Growth and Decomposition of Vallisneria americana in the Pamlico River Estuary,
W79-01362 5C

Review of R & D on Water Hyacinth Utilization in the Philippine Republic,
W79-01470 4A

AQUATIC POPULATIONS
A Biological Investigation of an Organically Polluted Urban Stream in Victoria,
W79-01016 5C

AQUATIC WEED CONTROL
Aquatic Weed Management: Some Prospects for the Sudan and the Nile Basin, Report of a Workshop Held at Khartoum, Sudan on 24-29 November 1975.
W79-01205 5G

AQUATIC WEEDS
Fresh-Water Weeds are a Resource,
W79-01197 5C

Phosphorus Cycling in Nuphar luteum Communities in the Lower Chowan River, North Carolina,
W79-01326 5C

Effects of Chelated Iron on the Growth of Two Species of Vallisneria,
W79-01446 5C

AQUEDUCTS
Regional Water Supply Capacity Expansion with Seasonal Demands and Energy Costs,
W79-01002 6A

AQUICULTURE
The Feasibility of Suspension Culture of Oysters (Crassostrea Virginica) at a Petroleum Platform off the Texas Coast,
W79-01024 5C

Persistent Blooms of Surf Diatoms Along the Northwest Coast,
W79-01200 5C

Mortalities of Pen-Reared Salmon Associated with Blooms of Marine Algae,
W79-01462 5C

Pollution Abatement Facilities at National Fish Hatcheries,
W79-01463 5G

Evaluation of Clinoptilolite for Ammonia Removal,
W79-01464 5D

Ammonia Production Rate and its Application to Fish Culture System Planning and Design,
W79-01465 5C

Waste Heat Aquaculture,
W79-01467 5C

Nutrient Recovery from Farm Ponds: Hydroponic Plant Production and Other Means, a Review,
W79-01477 5C

AQUIFER CHARACTERISTICS
Digital-Model Simulation of the Glacial-Outwash Aquifer, Otter Creek-Dry Creek Basin, Cortland County, New York,
W79-01377 2F

Hydrogeologic Maps of a Flood Detention Area Proposed by Southwest Florida Water Management District Green Swamp Area, Florida,
W79-01383 7C

Ground-Water Resources and Geology of Columbia County, Wisconsin,
W79-01384 2F

AQUIFER MANAGEMENT
Regional Ground-Water Management,
W79-01105 4B

The Legalization of Groundwater Shortage,
W79-01142 6E

National Water Commission Views Groundwater Protection,
W79-01155 5G

AQUIFERS
Land Subsidence in the Santa Clara Valley,
W79-01365 2F

Probable Yields of Wells in the Niagara Aquifer, Wisconsin,
W79-01367 7C

ARCTIC
Organization of Full-Scale Analyses of Filtration-Thermal Regime of Tailings Dams on Permafrost Foundations,
W79-01050 8D

Microwave Remote Sensing of Sea Ice in the Aidjex Main Experiment,
W79-01386 2C

A Preliminary Survey of the Zooplankton and Benthos of an Arctic Lake Near Prudhoe Bay, Alaska,
W79-01427 2H

ARIZONA
Characteristics of Arizona Ponderosa Pine Stands on Sandstone Soils,
W79-01099 2I

Economic Value of Hunting, Fishing, and General Rural Outdoor Recreation,
W79-01430 6B

ARKSHELL
Bioassays on Marine Organisms: Acute Toxicity Test of Mercury, Cadmium, and Copper to Arkshell, Anadara Broughtonii, from Jin-Dong Bay, and to Oyster, Crassostrea Gigas, from Kwangdo Bay, South Coast of Korea,
W79-01015 5C

ARSENIC COMPOUNDS
Accumulation of Arsenic in Sediments of Lakes Treated with Sodium Arsenite,
W79-01253 5B

ASBESTOS
Precision Analysis for Waterborne Chrysotile Asbestos by Transmission Electron Microscopy,
W79-01010 5A

ASH
Cycling of Elements in Duckweed (Lemna Perpusilla) in an Ash Settling Basin and Swamp Drainage System,
W79-01458 5C

ASSAY
Sedimentation and Microbial Metabolism in a Shallow Estuary,
W79-01091 2J

ASSESSMENT
Pre-Management Assessment of Aquatic Macroinvertebrates in a Small, Sedimentary Drainage Area of the Maumee and Lake Erie Basin.
W79-01096 5C

ASTERIONELLA SOCIALIS
Persistent Blooms of Surf Diatoms Along the Northwest Coast,
W79-01200 5C

ATCHAFALAYA BASIN FLOODWAY
Effect of Failure of the Old River Control Structure on Municipal and Industrial Water Supplies,
W79-01336 4A

ATLANTIC SALMON
The Behavior of Juvenile Atlantic Salmon (Salmo Salar) and Brook Trout (Salvelinus Fontinalis) with Regard to Temperature and to Water Velocity,
W79-01441 5C

ATMOSPHERIC CONTRIBUTIONS
A Chemical Budget of a Soft-Water Bog Lake: Benthic Contributions,
W79-01423 2H

ATOMIC ABSORPTION SPECTROSCOPY
Donnan Dialysis Enrichment of Cations,
W79-01011 2K

ATPASE
In Vitro Changes in the Activity of ATPases in the Gills of Carcinus Maenas Exposed to Various Concentrations of p,p'-DDT,
W79-01032 5C

ATTENUATION
Direct Injection of Reclaimed Water into an Aquifer,
W79-01108 5D

AUSTRALIA
A Biological Investigation of an Organically Polluted Urban Stream in Victoria,
W79-01016 5C

AUTOMATION
An Improved Hydrazine Reduction Method for the Automated Determination of Low Nitrate Levels in Freshwater,
W79-01042 5A

AUTONOMOUS MODELS
Renewable Resource Management and Extinction,
W79-01495 6A

AVERAGE RUNOFF
Runoff from Hydrologic Units in Florida,
W79-01368 7C

BACTERIA
Gull Droppings and Their Effects on Water Quality,
W79-01041 5B

Polyhalogenated 1-Octene-3-Ones, Antibacterial Metabolites from the Red Seaweed Bonnemaisonia Asparagoides,
W79-01204 5C

BALDCYPRESS
An Ecological Study of a Baldcypress Swamp in St. Charles Parish, Louisiana,
W79-01226 2L

BANK STABILITY
A Probabilistic Analysis of Embankment Stability Problems,
W79-01054 8D

BARCHAN DUNES
Sand Transport Model of Barchan Dune Equilibrium,
W79-01043 2J

BARGES
Computerized Costing Model for Inland Waterways Barge Transportation,
W79-01493 6A

BARNACLES
The Toxic Effects of the Water Soluble Fractions of No. 2 Fuel Oil and Three Aromatic Hydrocarbons on the Behavior and Survival of Barnacle Larvae,
W79-01025 5C

BARRIER ISLANDS
Man's Impact on the Barrier Islands of North Carolina,
W79-01220 6G

BASS
Nitrogen Fertilization of Ponds,
W79-01439 5C

BATHYMETRY
Analytic Solutions for Computer Flow Model Testing,
W79-01256 2L

BDELLOVIBRIOS
Biological Control Agents of Sewage Bacteria in Marine Habitats,
W79-01027 5C

BEACH EROSION
Man's Impact on the Barrier Islands of North Carolina,
W79-01220 6G

BEAUFORT SEA
Microwave Remote Sensing of Sea Ice in the Aidjex Main Experiment,
W79-01386 2C

BEN'S CREEK (PENN)
Impact of Mine Drainage on a Mountain Stream in Pennsylvania,
W79-01017 5C

BENEFICIAL USE
Riparian Rights Under the Texas Water Rights Adjudication Act - A Constitution Analysis,
W79-01140 6E

Matter of the Waters of Long Valley Creek System (Prospective Riparian Rights Cannot be Denied or Quantified by State Water Resources Board),
W79-01184 6E

Right to Construct Dams and Raise Water-Conducting Water Over Lands and Railroad Rights of Way,
W79-01185 6E

Fresh-Water Weeds are a Resource,
W79-01197 5C

Persistent Blooms of Surf Diatoms Along the Northwest Coast,
W79-01200 5C

Aquatic Weed Management: Some Prospects for the Sudan and the Nile Basin, Report of a Workshop Held at Khartoum, Sudan on 24-29 November 1975.
W79-01205 5G

Review of R & D on Water Hyacinth Utilization in the Philippine Republic,
W79-01470 4A

Nutrient Recovery from Farm Ponds: Hydroponic Plant Production and Other Means, a Review,
W79-01477 5C

BENTHIC CONTRIBUTIONS
A Chemical Budget of a Soft-Water Bog Lake: Benthic Contributions,
W79-01423 2H

BENTHIC FAUNA
A Biological Investigation of an Organically Polluted Urban Stream in Victoria,
W79-01016 5C

Impact of Mine Drainage on a Mountain Stream in Pennsylvania,
W79-01017 5C

The Effect of Several Physical and Chemical Factors Upon the Distribution of Benthic Macroinvertebrates in Dunham Pond, Connecticut,
W79-01330 5C

A Preliminary Survey of the Zooplankton and Benthos of an Arctic Lake Near Prudhoe Bay, Alaska,
W79-01427 2H

BENTHOS
A Preliminary Survey of the Zooplankton and Benthos of an Arctic Lake Near Prudhoe Bay, Alaska,
W79-01427 2H

BENZENE
The Toxic Effects of the Water Soluble Fractions of No. 2 Fuel Oil and Three Aromatic Hydrocarbons on the Behavior and Survival of Barnacle Larvae,
W79-01025 5C

BHAKRA DAM (INDIA)
Estimation of Water Balance of Lower Sutlej Catchment Up to Bhakra Dam Site by Thornthwaite's Method,
W79-01257 4A

BIALGAL ASSAY
A Bioassay Technique to Evaluate the Effect of Secondary Effluent on Algal Interactions in the Connecticut River,
W79-01089 5C

BIG THOMPSON RIVER (COLORADO)
Colorado Big Thompson Flood: Geologic Evidence of a Rare Hydrologic Event,
W79-01047 2E

BILHARZIA
Aquatic Weed Management: Some Prospects for the Sudan and the Nile Basin, Report of a Workshop Held at Khartoum, Sudan on 24-29 November 1975.
W79-01205 5G

BIO-REGENERATION
Bio-regeneration of Hydrocarbon-Exhausted Activated Carbon.
W79-01093 5D

BIOACCUMULATION
Chlorinated Hydrocarbons in Marine Insects,
W79-01023 5B

Uptake of Zinc by the Aquatic Larvae of Simulium Ornatipes (Diptera: Newatocera),
W79-01026 5C

Total Mercury and Methyl Mercury Contents in Fish from Lake Paijanne,
W79-01028 5C

Methods of Contamination of Two Freshwater Food Chains by Cobalt 60: I. Direct Contamination of the Organisms by the Water (Modalites de la Contamination de Deux Chaines Trophiques Dulcaquicoles par le Cobalt 60: I. Contamination Directe des Organismes par L'Eau),
W79-01442 5C

Influence of Sediment in Copper Toxicity Tests with the Polychaete Neanthes Arenaceodentata,
W79-01460 5A

Experimental Study on the Concentration Process of Trace Element Through a Food Chain from the Viewpoint of Nutrition Ecology,
W79-01461 5B

The Availability of Sediment-Bound Cobalt, Silver, and Zinc to a Deposit-Feeding Clam,
W79-01468 5B

BIOASSAY
Bioassays on Marine Organisms: Acute Toxicity Test of Mercury, Cadmium, and Copper to Arkshell, Anadara Broughtonii, from Jin-Dong Bay, and to Oyster, Crassostrea Gigas, from Kwangdo Bay, South Coast of Korea,
W79-01015 5C

The Toxic Effects of the Water Soluble Fractions of No. 2 Fuel Oil and Three Aromatic Hydrocarbons on the Behavior and Survival of Barnacle Larvae,
W79-01025 5C

Effects of Kelthane and Temperature on the Respiration of Crangon Franciscorum,
W79-01241 5C

Acute Toxicity at Three Primary Sewage Treatment Plants,
W79-01436 5C

Lag Adjustment Between Estimated and Actual Physiological Responses Conducted in Flow-Through Systems,
W79-01445 5C

Influence of Sediment in Copper Toxicity Tests with the Polychaete Neanthes Arenaceodentata,
W79-01460 5A

Use of Unicellular Algae for Evaluation of Potential Aquatic Contaminants,
W79-01476 5A

BIOAVAILABILITY
The Availability of Sediment-Bound Cobalt, Silver, and Zinc to a Deposit-Feeding Clam,
W79-01468 5B

BIOCHEMICAL OXYGEN DEMAND
Urban Runoff Pollution and Water Quality Planning,
W79-01134 5B

Removal of Soluble BOD sub 5 Primary Clarifiers,
W79-01317 5D

BIOCIDES
Chlorine effects on Larval Development of Striped Bass (Morone Saxatilis), White Perch (M. Americana) and Blueback Herring (Alosa Aestivalis),
W79-01456 5C

BIOCONTROL
Biological Control Agents of Sewage Bacteria in Marine Habitats,
W79-01027 5C

Aquatic Weed Management: Some Prospects for the Sudan and the Nile Basin, Report of a Workshop Held at Khartoum, Sudan on 24-29 November 1975.
W79-01205 5G

Nutrient Recovery from Farm Ponds: Hydroponic Plant Production and Other Means, a Review,
W79-01477 5C

BIODEGRADATION
Uptake and Release of Petroleum by Intertidal Sediments at Port Valdez, Alaska,
W79-01022 5B

BIOGEOCHEMICAL CYCLES
Biodeposition by Salt-Marsh Invertebrates,
W79-01288 5B

BIOINDICATORS
Pollution Studies of River Khan (Indore) India -- I. Biological Assessment of Pollution,
W79-01018 5A

Use of Unicellular Algae for Evaluation of Potential Aquatic Contaminants,
W79-01476 5A

BIOLOGICAL COMMUNITIES
A Biological Investigation of an Organically Polluted Urban Stream in Victoria,
W79-01016 5C

Abundance, Diversity, and Stability in Shore-Zone Fish Communities in an Area of Long Island Sound Affected by the Thermal Discharge of a Nuclear Power Station,
W79-01021 5C

Biological Control Agents of Sewage Bacteria in Marine Habitats,
W79-01027 5C

Distribution of Bluegreen Algae in a Mississippi Gulf Coast Salt Marsh,
W79-01356 5B

BIOLOGICAL MEMBRANES
In Vitro Changes in the Activity of ATPases in the Gills of Carcinus Maenas Exposed to Various Concentrations of p,p'-DDT,
W79-01032 5C

BIOLOGICAL POLLUTION
Water Quality and Control of Plant Pathogens in Irrigation Reuse,
W79-01358 5D

BIOLOGICAL TREATMENT
Wastewater Problems in the Food Processing Industry in the Light of Modern Water Management (Az elelmiszeripar szennyviz-problemai a korszeru vizgazdalkodas tukreben),
W79-01071 5D

Differential Bed Kinetic Analysis of Heavy Metal Removals by Biological Slimes,
W79-01314 5D

Treatment and Disposal of Complex Industrial Wastes,
W79-01321 5D

Method of Treatment of an Oxidizable Material by a Biochemical Process,
W79-01412 5D

Method and Apparatus for the Biological Cleansing of Waste Water,
W79-01413 5D

Synthesis of Optimal Feedback Control Systems for Fermentations and Biological Waste Treatment Processes,
W79-01428 5D

BIOLOGICALLY ACTIVE METALS
The Influence of Colloidal Organic Matter on Iron and Iron-Phosphorus Cycling in an Acid Bog Lake,
W79-01219 5C

BIOLOGY
Inland Wetland Definitions,
W79-01335 6E

BIOMASS
Seasonal Growth and Decomposition of Vallisneria americana in the Pamlico River Estuary,
W79-01362 5C

Standing Crops of Marsh Vegetation of Two Tributaries of Chesapeake Bay,
W79-01433 2L

BIOTA
Heavy Metal Accumulation and its Effect on the Biota of an Industrial Settling Pond,
W79-01124 5D

BIRDS
Gull Droppings and Their Effects on Water Quality,
W79-01041 5B

BLACKWATER RIVER
Exceptional Tolerance to Low pH of some Tropical Blackwater Fish,
W79-01098 5C

BLEACHING WASTES
Laboratory Investigation of Water Pollution by Organic Substances in Flax Wastes Delignification (Laboratorne sledovanie organickeho znecistenia vod pri delignifikacii lanovych odpadov),
W79-01085 5B

BOGS
Monthly Determinations of the Concentrations of Sodium, Potassium, Magnesium and Calcium in the Rain and Pools of the Silver Flowe National Nature Reserve.
W79-01212 2K

Relationships Between Mineral Supply and Growth of Narthecium Ossifragum (L.) Huds. on Mire Ecosystems,
W79-01216 2H

The Influence of Colloidal Organic Matter on Iron and Iron-Phosphorus Cycling in an Acid Bog Lake,
W79-01219 5C

Interrelation of Forest and Bog.
W79-01297 2H

Micro-Inhabitants of Marsh Peat Soils in the Tomsk Region,
W79-01299 2H

The Decomposition of Some Peat-Forming Plants Under Natural Conditions,
W79-01300 2H

Interrelation Between Insect Larvae and Soil Microflora in Forest Bogs,
W79-01301 2G

The Shift of Bog Vegetation Under the Influence of Drying,
W79-01304 2H

About the Afforestation of Bogs in Tomsk Region,
W79-01305 2H

BOGS *DRYING
Some Results of Station Research on the Interrelation of Forest and Bog in Western Siberia,
W79-01298 2H

BONDING
Uptake of Zinc by the Aquatic Larvae of Simulium Ornatipes (Diptera: Newatocera),
W79-01026 5C

BONNEMAISONIA ASPARAGOIDES
Polyhalogenated 1-Octene-3-Ones, Antibacterial Metabolites from the Red Seaweed Bonnemaisonia Asparagoides,
W79-01204 5C

BOREHOLES
Boring and Sampling Techniques,
W79-01103 8G

The Use of Inclined Boreholes for Well Development,
W79-01107 8B

BRACKISH WATER
Cation-Exchange Column Behavior in a Desalination Process with Regenerant Recovery,
W79-01280 3A

The Role of Membrane Methods in the Desalination of Brackish Water,
W79-01343 3A

Standing Crops of Marsh Vegetation of Two Tributaries of Chesapeake Bay,
W79-01433 2L

BREAKWATERS
Breakwater,
W79-01400 8A

BREEDING
Can Salamanders and Frogs Survive the Threat of Acid Precipitation,
W79-01005 5C

BREWING INDUSTRY
The Response of Firms to Pollution Charges,
W79-01499 5G

BROOK TROUT
The Behavior of Juvenile Atlantic Salmon (Salmo Salar) and Brook Trout (Salvelinus Fontinalis) with Regard to Temperature and to Water Velocity,
W79-01441 5C

BRYOPHYLLUM-CALYCINUM
Injurious Effect of Tap Water on Rooting of Cuttings of Bryophyllum Calycinum,
W79-01221 5C

BUFFALO CREEK (WVA)
The Development and Testing of a Dam-Break Flood Forecasting Model,
W79-01270 8B

BURNING
The Effect of Fire on Species Composition in Cypress Dome Ecosystems,
W79-01292 4C

CADMIUM
Bioassays on Marine Organisms: Acute Toxicity Test of Mercury, Cadmium, and Copper to Arkshell, Anadara Broughtonii, from Jin-Dong Bay, and to Oyster, Crassostrea Gigas, from Kwangdo Bay, South Coast of Korea,
W79-01015 5C

Oxidation-Reduction Chemistry And Aqueous Ammonium Oxidation in the Estimation of Nitrate by the Cadmium Reduction Method,
W79-01100 5B

Cadmium Availability to Rice in Sludge-Amended Soil Under 'Flood' and 'Nonflood' Culture,
W79-01127 5E

Yield and Cadmium Accumulation of Forage Species in Relation to Cadmium Content of Sludge-Amended Soil,
W79-01237 5C

Growth and Cadmium Accumulation of Plants Grown on a Soil Treated with a Cadmium-Enriched Sewage Sludge,
W79-01282 5C

CALCAREOUS ALGAE
Calcification and Its Role Among the Macroalgae,
W79-01097 2I

CALCAREOUS SOILS
Calcification and Its Role Among the Macroalgae,
W79-01097 2I

CALCIUM HYDROXIDE
Mixed-Bed Ion Exchange Desalting by the Calcium Hydroxide Process,
W79-01340 3A

CALCIUM SULFATE
High-Temperature Solubilities of Calcium Sulfate Hemihydrate and Anhydrite in Natural Seawater Concentrates,
W79-01128 3A

CALIFORNIA
Sand Transport Model of Barchan Dune Equilibrium,
W79-01043 2J

Heat and Thrust Requirements of a Thermal Fog Dispersal System,
W79-01058 3B

A Societal Assessment of the Proposed Sierra Snowpack Augmentation Project,
W79-01063 3B

Groundwater Law: More Questions Than Answers,
W79-01118 6E

The Legalization of Groundwater Shortage,
W79-01142 6E

Matter of the Waters of Long Valley Creek System (Prospective Riparian Rights Cannot be Denied or Quantified by State Water Resources Board),
W79-01184 6E

City of Berkely V. Superior Court for the County of Alameda (Additional Adjudication Issues Need to Determine if Land Subject to Public 'Tideland Trust'),
W79-01189 6E

Hollister Park Investment Co. V. Goleta County Water District (No Damages to Landowner Denied Water During Water Shortage Emergency).
W79-01190 6E

Geochemistry of Mercury in Palos Verdes Sediments,
W79-01250 5B

Control of Transients in Series Channel with Gates,
W79-01255 8B

Land Subsidence in the Santa Clara Valley,
W79-01365 2F

CANADA
Highway Construction Impact on Water-Supply Lakes,
W79-01260 4C

The Response of Firms to Pollution Charges,
W79-01499 5G

CAPITAL SUPPLY
Viewpoint from the Capital Market,
W79-01488 6B

CARBON DIOXIDE
On the Mechanisms of CO2 and CH4 Production in Natural Anaerobic Environments,
W79-01135 5C

The Response of Empetrum Nigrum L. to Different Mire Water Regimes, with Special Reference to Wybunbury Moss, Cheshire and Feathered Moss, Derbyshire,
W79-01293 5C

Seasonal Variation in Pco2 and C-13 Content of Soil Atmosphere,
W79-01387 2F

CARCINUS
In Vitro Changes in the Activity of ATPases in the Gills of Carcinus Maenas Exposed to Various Concentrations of p,p'-DDT,
W79-01032 5C

CARP
Influence of Temperature on Growth Promotion and Body Composition of Carp (Cyprinus Carpio) Due to Bovine Growth Hormone,
W79-01438 5C

CARRYING CAPACITY
A Bioassay Technique to Evaluate the Effect of Secondary Effluent on Algal Interactions in the Connecticut River,
W79-01089 5C

CATFISHES
A Biological Assessment of Fish and Benthic Populations Inhabiting a Kraft Mill Effluent Channel,
W79-01448 5C

CATHODES
Fixed-Bed Electrolysis - A Process for Purifying Waste Water Contaminated with Metals (Festbettelektrolyse - ein Verfahren zur Reinigung metallhaltiger Abwasser),
W79-01081 5D

CATION EXCHANGE
Quantitative Determination of Quaternary Ammonium Bases (QAB) in Water and Wastewater by Thin Layer Chromatography,
W79-01070 5A

Cation-Exchange Column Behavior in a Desalination Process with Regenerant Recovery,
W79-01280 3A

Method for Removing of Multivalent Heavy Metals from Metal Plating Waste Effluents,
W79-01415 5D

CATIONS
Donnan Dialysis Enrichment of Cations,
W79-01011 2K

CENTRIFUGATION
Water Content Reduction of Metal-Plating Waste Sludge by a Press and Centrifuge (Mekki suraji no kokaiteki dassui ni kansuru kisoteki kenkyu),
W79-01082 5E

CESIUM
Experimental Study on the Concentration Process of Trace Element Through a Food Chain from the Viewpoint of Nutrition Ecology,
W79-01461 5B

CHAETOCEROS ARMATUM
Persistent Blooms of Surf Diatoms Along the Northwest Coast,
W79-01200 5C

CHANNA PUNCTATUS
Effect of Mercuric Chloride on the Digestive System of a Teleost Fish, Channa Punctatus,
W79-01019 5C

CHANNEL IMPROVEMENT
Oak Leaf Country Club, Inc. v. Wilson (Flood Damage Caused by Channelization),
W79-01182 6E

Stream Channelization Impacts on Songbirds and Small Mammals in Vermont,
W79-01431 6G

CHANNEL MORPHOLOGY
The Case of the Shrinking Channels-The North Platte and Platte Rivers in Nebraska,
W79-01380 4A

CHANNEL SHRINKAGE
The Case of the Shrinking Channels-The North Platte and Platte Rivers in Nebraska,
W79-01380 4A

CHANNELIZATION
Stream Channelization Impacts on Songbirds and Small Mammals in Vermont,
W79-01431 6G

CHARLES RIVER (MASS)
Fish Ladder for Charles River Dam, Charles River, Massachusetts, Hydraulic Model Investigation,
W79-01052 8I

CHELATION
Effects of Chelated Iron on the Growth of Two Species of Vallisneria,
W79-01446 5C

CHEMCONTROL
Aquatic Weed Management: Some Prospects for the Sudan and the Nile Basin, Report of a Workshop Held at Khartoum, Sudan on 24-29 November 1975.
W79-01205 5G

CHEMICAL ANALYSIS
Ion Exchange Membrane Methods for Continuous Removal of Ions from Water and Trace Chemical Analysis,
W79-01327 5A

Chemical Quality of Water Used for Municipal Supply in Florida, 1975,
W79-01375 7C

A Chemical Budget of a Soft-Water Bog Lake: Benthic Contributions,
W79-01423 2H

CHEMICAL BUDGET
A Chemical Budget of a Soft-Water Bog Lake: Benthic Contributions,
W79-01423 2H

CHEMICAL OXYGEN DEMAND
Determination of the Bichromate Oxidizability of Sugar Factory Effluents (Opredelenie bikhromatnoy okislyaemosti stochnykh vod sakharnogo zavoda),
W79-01074 5A

CHEMICAL PRECIPITATION
Preparation of Copper Precipitate for Electrolytic Copper Recovery from Electroplating In-

dustry Wastewater (Denki mekki kojo haisui kara no do no denkai kaishu o mokteki to shita do chinden no seisei hoho),
W79-01076 5D

CHEMICAL WASTES
Electrochemical Purification of Wastewaters, Containing Polyester Resin (Elektrokhimicheskaya ochistka stochaykh vod, soderzhashchikh poliefirnuyu smolu),
W79-01066 5D

Extraction of Ammonium Ions from Wastewaters Generated in the Production of Compound Fertilizers and Their Utilization by Ion-Exchange Method (Izvlechenie ionov ammoniya iz stochaykh vod proizvodsty slozhnykh udobrenii ikh utilizatsiya metodom ionnogo obmena),
W79-01068 5D

Photo-Decomposition of Aqueous Solutions of Phenol (Fenooru suiyoeki no hikari bunkai),
W79-01069 5D

Application of Packed Biopolar Cell to Electrolytic Treatment of Waste Waters, (In Japanese),
W79-01080 5D

CHEMISTRY ANALYSIS
An Improved Hydrazine Reduction Method for the Automated Determination of Low Nitrate Levels in Freshwater,
W79-01042 5A

CHESAPEAKE BAY
Changes in Submerged Aquatic Macrophyte Populations at the Head of Chesapeake Bay, 1958-1975,
W79-01030 5C

Standing Crops of Marsh Vegetation of Two Tributaries of Chesapeake Bay,
W79-01433 2L

CHINOOK SALMON
Chronic Exposure of Chinook Salmon Eggs and Alevins to Gamma Irradiation: Effects on Their Return to Freshwater as Adults,
W79-01455 5C

CHLORINATED HYDROCARBON PESTICIDES
Chloro-Organics in Surface Water Sources for Potable Water,
W79-01472 5B

CHLORINATION
Wastewater Problems in the Food Processing Industry in the Light of Modern Water Management (Az elelmiszeripar szennyviz-problemai a korszeru vizgazdalkodas tukreben),
W79-01071 5D

CHLORINE
Injurious Effect of Tap Water on Rooting of Cuttings of Bryophyllum Calycinum,
W79-01221 5C

Chlorine effects on Larval Development of Striped Bass (Morone Saxatilis), White Perch (M. Americana) and Blueback Herring (Alosa Aestivalis),
W79-01456 5C

CHOWAN RIVER (NC)
Phosphorus Cycling in Nuphar luteum Communities in the Lower Chowan River, North Carolina,
W79-01326 5C

CHROMATOGRAPHY
Quantitative Determination of Quaternary Ammonium Bases (QAB) in Water and Wastewater by Thin Layer Chromatography,
W79-01070 5A

CHROMIUM
Effects of Chromium on Some Aquatic Plants,
W79-01031 5C

Effect of Copper and Tri- and Hexavalent Chromium on the Work of an Activated Sludge,
W79-01079 5D

The Influence of Temperature and Salinity on the Toxicity of Hexavalent Chromium to the Grass Shrimp Palaemonetes Pugio (Holthuis),
W79-01457 5C

CLAMS
A Survey of the Freshwater Mussels (Bivalvia: Unionidae) of the Kanawha River of West Virginia,
W79-01435 5C

The Availability of Sediment-Bound Cobalt, Silver, and Zinc to a Deposit-Feeding Clam,
W79-01468 5B

CLARK FORK RIVER (MONT)
Heavy Metal Accumulation and its Effect on the Biota of an Industrial Settling Pond,
W79-01124 5D

CLASSIFICATION
Inland Wetland Definitions,
W79-01335 6E

CLAYS
Mud and Clay,
W79-01120 8G

CLOUD SEEDING
Randomized Cloud Seeding in the San Juan Mountains, Colorado,
W79-01035 3B

CLOVERS
The Effect of Dirunal Variation in Light and Temperature on the Acetylene Reduction Activity (N2 Fixation) of Subterranean Clover,
W79-01092 2I

COAGULATION
Fluoride Removal from Potable Water Supplies,
W79-01351 5F

COAL MINE WASTES
Impact of Mine Drainage on a Mountain Stream in Pennsylvania,
W79-01017 5C

COAL MINES
The Industry's Role in Energy Management,
W79-01484 6B

Coal Development and Reclamation - Planning and Conservation,
W79-01489 6B

COALS
Coordinated Energy Management,
W79-01479 6B

The Industry's Role in Energy Management,
W79-01484 6B

COASTAL MARSHES
Hydrologic Impact of Land Drainage on Estuaries,
W79-01385 4A

COASTAL STRUCTURES
Rules and Procedure for Coastal Construction and Excavation.
W79-01186 6E

COASTAL ZONE MANAGEMENT
An Alternative Perspective on Common Property Resource Allocation Decisions in the Coastal Zone,
W79-01494 6A

COASTS
Coastal Planning: The Designation and Management of Areas of Critical Environmental Concern,
W79-01152 5G

COBALT
Methods of Contamination of Two Freshwater Food Chains by Cobalt 60: I. Direct Contamination of the Organisms by the Water (Modalites de la Contamination de Deux Chaines Trophiques Dulcaquicoles par le Cobalt 60: I. Contamination Directe des Organismes par L'Eau),
W79-01442 5C

The Availability of Sediment-Bound Cobalt, Silver, and Zinc to a Deposit-Feeding Clam,
W79-01468 5B

COFFERDAMS
Tailings Cofferdams on Permafrost Foundations in Yakutskaya ASSR,
W79-01051 8D

COLLOIDAL ORGANIC MATTER
The Influence of Colloidal Organic Matter on Iron and Iron-Phosphorus Cycling in an Acid Bog Lake,
W79-01219 5C

COLOR
Investigations of the Decoloration of Wastewaters Generated in Conifer Sulfate Pulp Mills (Cercetari privind decolorarea apelor reziduale provenite de la fabricarea celulozei sulfat din rasinoase),
W79-01084 5D

COLORADO
Randomized Cloud Seeding in the San Juan Mountains, Colorado,
W79-01035 3B

The Relationship Between Radar Reflectivity Factor and Hail at the Ground for Northeast Colorado Thunderstorms,
W79-01037 7B

Colorado Big Thompson Flood: Geologic Evidence of a Rare Hydrologic Event,
W79-01047 2E

COLORADO FRONT RANGE
Mine Effluents in the Front Range Mineral Belt of Colorado,
W79-01008 5B

COLORADO MINERAL BELT
Mine Effluents in the Front Range Mineral Belt of Colorado,
W79-01008 5B

Geochemistry of Mine Effluents in the Front Range Mineral Belt of Colorado,
W79-01363 5A

COLORADO RIVER
Nitrogen and Irrigation Management to Reduce Return-Flow Pollution in the Columbia Basin,
W79-01001 5G

COLORADO RIVER BASIN
Randomized Cloud Seeding in the San Juan Mountains, Colorado,
W79-01035 3B

Energy and the Colorado River,
W79-01167 3E

Salt Pickup by Overland Flow in the Price River Basin, Utah,
W79-01245 5B

COLUMBIA COUNTY
Ground-Water Resources and Geology of Columbia County, Wisconsin,
W79-01384 2F

COLUMBIA RIVER
Transmissivity and Hydraulic Conductivity of Saturated Sedimentary Rocks in the Hanford Reservation,
W79-01053 8B

COMMERCIAL FISH
Total Mercury and Methyl Mercury Contents in Fish from Lake Paijanne,
W79-01028 5C

COMMERCIAL SHELLFISH
The Feasibility of Suspension Culture of Oysters (Crassostrea Virginica) at a Petroleum Platform off the Texas Coast,
W79-01024 5C

Water Quality Investigation Related to Seafood Processing Wastewater Discharges at Dutch Harbor, Alaska, October 1975, October 1976,
W79-01469 5C

COMMUNITY DEVELOPMENT
Citizen Participation for Successful Village Water Supply,
W79-01112 6B

COMPLEXATION
Effect of Complexation by Natural Organic Ligands on the Toxicity of Copper to a Unicellular Alga, Monochrysis Lutheri,
W79-01449 5C

COMPLEXING CAPACITY
Evaluation of Micromolar Complexiometric Titrations for the Determination of the Complexing Capacity of Natural Waters,
W79-01344 5A

Determination of the Complexing Capacity of Natural Water by Cobalt (III) Complexation,
W79-01345 5A

COMPREHENSIVE PLANNING
Energy and the Colorado River,
W79-01167 3E

COMPUTER-AIDED DESIGN
Crops-Wide Conference on Computer-Aided Design in Structural Engineering, Volume XI: Earthquake and Dynamic Analyses,
W79-01057 8G

COMPUTER MODELS
Trade Off Analysis in Environmental Decision-making: An Alternative to Weighted Decision Models,
W79-01242 6G

Analytic Solutions for Computer Flow Model Testing,
W79-01256 2L

Cost Estimates for Construction of Publicly-Owned Wastewater Treatment Facilities. Volume 3. Summaries of Technical Data for Combined Sewer Overflows and Stormwater Discharge. 1976 Needs Survey,
W79-01308 5G

Sensitivity Analysis of a Phosphorus Removal Strategy Computer Model,
W79-01310 5D

Optimal Operation of Large Agricultural Watersheds with Water Quality Constraints,
W79-01355 4D

Digital-Model Simulation of the Glacial-Outwash Aquifer, Otter Creek-Dry Creek Basin, Cortland County, New York,
W79-01377 2F

Applying a Chemical Modelling Technique to Ecological Problems,
W79-01444 5B

Computerized Costing Model for Inland Waterways Barge Transportation,
W79-01493 6A

CONFERENCES
A Constitution for the Oceans: Comments and Suggestions Regarding Part XI of the Informal Composite Negotiating Text,
W79-01149 6E

Should the Law of the Sea Conference Be Saved,
W79-01157 6E

Status Report on Law of the Sea Conference.
W79-01176 6E

Proceedings of Dam-Break Flood Routing Model Workshop.
W79-01262 8B

CONNECTICUT
Abundance, Diversity, and Stability in Shore-Zone Fish Communities in an Area of Long Island Sound Affected by the Thermal Discharge of a Nuclear Power Station,
W79-01021 5C

Sedimentation and Microbial Metabolism in a Shallow Estuary,
W79-01091 2J

The Effect of Several Physical and Chemical Factors Upon the Distribution of Benthic Macroinvertebrates in Dunham Pond, Connecticut,
W79-01330 5C

Dissolved Organic Carbon Fluxes in the Shetucket River of Eastern Connecticut, USA,
W79-01337 5C

A Chemical Budget of a Soft-Water Bog Lake: Benthic Contributions,
W79-01423 2H

CONNECTICUT RIVER
A Bioassay Technique to Evaluate the Effect of Secondary Effluent on Algal Interactions in the Connecticut River,
W79-01089 5C

CONSERVATION
Inclusion of Alaska Lands in National Park, Forest, Wildlife Refuge, and Wild and Scenic Rivers Systems (Part II, Washington, D.C.).
W79-01177 6E

Inclusion of Alaska Lands in Natl. Park, Forest, Wildlife Refuge, and Wild and Scenic Rivers Systems (Part V, Atlanta, GA.).
W79-01178 6E

Inclusion of Alaska Lands in Natl. Park, Forest Wildlife Refuge and Wild and Scenic Rivers Systems (Part XII, Fairbanks, Alaska).
W79-01179 6E

Inclusion of Alaska Lands in National Park, Forest, Wildlife Refuge, and Wild Scenic Rivers Systems (Part XIII, Alaska Town Meetings),
W79-01180 6E

Implementing 'Best Management Practices' for Residuals: The Waste Exchange,
W79-01309 5G

Coal Development and Reclamation - Planning and Conservation,
W79-01489 6B

CONSTITUTIONAL LAW
Riparian Rights Under the Texas Water Rights Adjudication Act - A Constitution Analysis,
W79-01140 6E

CONSTRUCTION
Highway Construction Impact on Water-Supply Lakes,
W79-01260 4C

CONTINENTAL SHELF
Wind Effects on Surface to Bottom Fronts,
W79-01045 2L

CONTROL
Synthesis of Optimal Feedback Control Systems for Fermentations and Biological Waste Treatment Processes,
W79-01428 5D

COPEPODS
The Effect of Temperature on the Development of Diapausing and Subitaneous Eggs in Several Freshwater Copepods,
W79-01033 5C

COPPER
Bioassays on Marine Organisms: Acute Toxicity Test of Mercury, Cadmium, and Copper to Arkshell, Anadara Broughtonii, from Jin-Dong Bay, and to Oyster, Crassostrea Gigas, from Kwangdo Bay, South Coast of Korea,
W79-01015 5C

Effect of Copper and Tri- and Hexavalent Chromium on the Work of an Activated Sludge,
W79-01079 5D

Application of Packed Biopolar Cell to Electrolytic Treatment of Waste Waters, (In Japanese),
W79-01080 5D

Injurious Effect of Tap Water on Rooting of Cuttings of Bryophyllum Calycinum,
W79-01221 5C

Effect of Complexation by Natural Organic Ligands on the Toxicity of Copper to a Unicellular Alga, Monochrysis Lutheri,
W79-01449 5C

The Toxic Effect of Copper on Algae and Rotifers from a Soda Lake (Lake Nakuru, East Africa),
W79-01459 5C

Influence of Sediment in Copper Toxicity Tests with the Polychaete Neanthes Arenaceodentata,
W79-01460 5A

COPPER COMPOUNDS
Preparation of Copper Precipitate for Electrolytic Copper Recovery from Electroplating Industry Wastewater (Denki mekki kojo haisui kara no do no denkai kaishu o mokteki to shita do chinden no seisei hoho),
W79-01076 5D

COPPS BROOK WATERSHED (CONN)
Sedimentation and Microbial Metabolism in a Shallow Estuary,
W79-01091 2J

CORALVILLE RESERVOIR (IA)
Coralville Water Quality Study Annual Report, Water Year October 1, 1975 to September 30, 1976,
W79-01473 5B

CORD GRASS
Response in Production of Cord Grass, Spartina Alterniflora, to Inorganic Nitrogen and Phosphorus Fertilizer,
W79-01225 2L

CORES
Boring and Sampling Techniques,
W79-01103 8G

CORN (FIELD)
Corn and Alfalfa Production as Influenced by Irrigation and Salinity,
W79-01136 3C

CORRELATION ANALYSIS
Correlations Between Maximum Rate of Precipitation and Mesoscale Parameters,
W79-01036 2B

CORROSION
Scaling and Corrosion in an Experimental Geothermal Power Plants,
W79-01106 3C

Potentiodynamic Studies of Antimony in Acidic and Alkaline Solutions,
W79-01232 8G

Polarization and Photopotentials of InSb in NaOH,
W79-01233 8G

Electrodissolution of Nickel in Molten LiCl-KCl,
W79-01234 8G

Hydrogen Evolution and Corrosion Behavior of Fe-Ni Alloys in H2SO4 - Effect of Temperature, Cl- and Benzatriazole,
W79-01235 8G

Electrochemical Behavior of Rotating Iron Disks Effect of FE(111),
W79-01281 8G

Method for Sequestering Metal Ions,
W79-01417 5G

COST ALLOCATION
Equitable Recovery of Industrial Waste Treatment Costs in Municipal Systems, Federal Guidelines.
W79-01206 5D

COST ANALYSIS
Sensitivity Analysis of a Phosphorus Removal Strategy Computer Model,
W79-01310 5D

Computerized Costing Model for Inland Waterways Barge Transportation,
W79-01493 6A

COST-BENEFIT ANALYSIS
The Tennessee Valley Authority's Tellico Dam Project-Costs, Alternatives, and Benefits.
W79-01193 6B

COSTS
Non-Resident Hunters--Benefactors or Bad Men.
W79-01138 6B

Analysis of Economic Effect of Environmental Regulations on Integrated Iron and Steel Industry. Volume II,
W79-01194 5G

Cost Estimates for Construction of Publicly-Owned Wastewater Treatment Facilities. Volume 3. Summaries of Technical Data for Combined Sewer Overflows and Stormwater Discharge. 1976 Needs Survey,
W79-01308 5G

The National Energy Plan,
W79-01480 6B

Resource Extraction and Recycling with Environmental Costs,
W79-01492 6A

CRABS
In Vitro Changes in the Activity of ATPases in the Gills of Carcinus Maenas Exposed to Various Concentrations of p,p'-DDT,
W79-01032 5C

CRIME
Effects of Selected Changes in the Institutional and Human Environment Upon Output Per Unit of Input,
W79-01491 6B

CRITHIDIA
Effect of DDT and Polychlorinated Biphenyls on Cell Population Growth of Crithidia Fasciculata, A Flagellated Protozoan,
W79-01013 5C

CROP PRODUCTION
An Economic Evaluation of Cropland Use as a Control for Sediment Nonpoint Pollution,
W79-01498 5G

CRUSTACEANS
The Toxic Effects of the Water Soluble Fractions of No. 2 Fuel Oil and Three Aromatic Hydrocarbons on the Behavior and Survival of Barnacle Larvae,
W79-01025 5C

CRYSTALLIZATION
Induced Crystallization of Large Free Ice Crystals in Slowly Flowing Brine,
W79-01429 3A

CYANOPHYTA
Ultrastructure of the Blue-Green Alga Anacystis Nidulans Infected with AS-1 Virus,
W79-01334 5C

Distribution of Bluegreen Algae in a Mississippi Gulf Coast Salt Marsh,
W79-01356 5B

CYCLING NUTRIENTS
A Dynamic Water Quality Model of Lake Biwa - A Simulation Study of the Lake Eutrophication,
W79-01475 5C

CYCLOPOIDS
The Effect of Temperature on the Development of Diapausing and Subitaneous Eggs in Several Freshwater Copepods,
W79-01033 5C

CYPRESS TREES
The Effect of Fire on Species Composition in Cypress Dome Ecosystems,
W79-01292 4C

DAILY HYDROGRAPHS
Generation of Daily Precipitation Over an Area,
W79-01261 2B

DAM-BREAK WAVES
Dam-Break Flood Wave Computation by Method of Characteristics and Linearized Implicit Schemes,
W79-01274 8B

DAM CONSTRUCTION
Right to Construct Dams and Raise Water-Conducting Water Over Lands and Railroad Rights of Way,
W79-01185 6E

DAM FAILURE
First Inspections Highlight US Dams Threat.
W79-01048 8G

Proceedings of Dam-Break Flood Routing Model Workshop.
W79-01262 8B

The Dam-Break Wave and the Bore Collapse on a Beach,
W79-01263 8B

Unsteady Flow Analysis of Dam-Break Waves,
W79-01264 8B

Flood Plain Inundation Caused by Dam Failure,
W79-01265 8B

Floods from Breaching of Dams,
W79-01267 8B

Unsteady Flow Modeling of Dam-Break Waves,
W79-01268 8B

A Simulation of the Hydraulic Events During and Following the Teton Dam Failure,
W79-01269 8B

The Development and Testing of a Dam-Break Flood Forecasting Model,
W79-01270 8B

Calculating and Routing the Teton Dam-Break Flood,
W79-01271 8B

Comparative Analysis of Routing Techniques for the Floodwave from a Ruptured Dam,
W79-01272 8B

Qualitative Comparison of Three Dam Break Routing Models,
W79-01273 8B

Dam-Break Flood Wave Computation by Method of Characteristics and Linearized Implicit Schemes,
W79-01274 8B

A Numerical Model for Multidimensional Unconstrained Flow Over Irregular Terrain,
W79-01275 8B

Dam Break Flood Wave Analysis: Problems, Pitfalls, and Partial Solutions,
W79-01276 8B

Simulation of Dam Break Flooding Under Normal and Probable Maximum Flood Conditions,
W79-01277 8B

Criteria for Routing the Dam-Break Flood,
W79-01278 8B

DAM FOUNDATIONS
Approximate Calculation of Nonstationary Temperature Regime of a Rock-Ice Dam.
W79-01049 8D

Organization of Full-Scale Analyses of Filtration-Thermal Regime of Tailings Dams on Permafrost Foundations,
W79-01050 8D

Tailings Cofferdams on Permafrost Foundations in Yakutskaya ASSR,
W79-01051 8D

DAM INSPECTIONS
First Inspections Highlight US Dams Threat.
W79-01048 8G

DAMAGES
Warrior, Inc. V. Easterly (Developer Assessed Damages Caused by Excess Drainage Water and Debris Polluting Landowner's Pond,
W79-01192 6E

DAMS
First Inspections Highlight US Dams Threat.
W79-01048 8G

Organization of Full-Scale Analyses of Filtration-Thermal Regime of Tailings Dams on Permafrost Foundations,
W79-01050 8D

Fish Ladder for Charles River Dam, Charles River, Massachusetts, Hydraulic Model Investigation,
W79-01052 8I

DAMS

Analysis of Water Flow Problems in the Hells Canyon of the Snake River,
W79-01359 4A

DANDENONG CREEK (AUSTRALIA)
A Biological Investigation of an Organically Polluted Urban Stream in Victoria,
W79-01016 5C

DATA COLLECTIONS
Time Averaged Areal Mean of Precipitation: Estimation and Network Design,
W79-01357 2B

DATING
Trichlorofluoromethane, a New Hydrologic Tool for Tracing and Dating Ground Water,
W79-01422 2F

DDT
Effect of DDT and Polychlorinated Biphenyls on Cell Population Growth of Crithidia Fasciculata, A Flagellated Protozoan,
W79-01013 5C

Shell Structure of Immature Roman Snails (Helix Pomatia) After Exposure to P,P'-DDT,
W79-01020 5C

Chlorinated Hydrocarbons in Marine Insects,
W79-01023 5B

Chlorinated Hydrocarbons and Mercury in Aquatic Vascular Plants of Lake Paijanne, Finland,
W79-01029 5C

In Vitro Changes in the Activity of ATPases in the Gills of Carcinus Maenas Exposed to Various Concentrations of p,p'-DDT,
W79-01032 5C

DECIDUOUS FORESTS
Nutrient Fluxes in Precipitation, Throughfall, and Stemflow in an Oak-Hickory Forest,
W79-01246 2I

DECISION MAKING
Public Involvement in Natural Resource Development: A Review of Water Resource Planning,
W79-01153 6B

Trade Off Analysis in Environmental Decision-making: An Alternative to Weighted Decision Models,
W79-01242 6G

Coordinated Energy Management,
W79-01479 6B

An Alternative Perspective on Common Property Resource Allocation Decisions in the Coastal Zone,
W79-01494 6A

DECOMPOSING ORGANIC MATTER
The Decomposition of Some Peat-Forming Plants Under Natural Conditions,
W79-01300 2H

DEFIBERING
Review of R & D on Water Hyacinth Utilization in the Philippine Republic,
W79-01470 4A

DEGRADATION (DECOMPOSITION)
Photo-Decomposition of Aqueous Solutions of Phenol (Fenooru suiyoeki no hikari bunkai),
W79-01069 5D

DELAWARE
Nitrate and Nitrite in the Surface Waters of Two Delaware Salt Marshes,
W79-01291 5B

DELAWARE BAY
Trace Metal Enhancement in the Biotic and Abiotic Components of an Estuarine Tidal Front,
W79-01046 5B

DELAWARE RIVER
Organic Compounds in the Delaware River,
W79-01252 5B

DELAWARE RIVER BASIN
Trends in the Abundance of American Shad, Alosa Sapidissima, in the Delaware River Basin,
W79-01322 5C

DENSITY
The Density of Seawater Solutions at One Atmosphere as a Function of Temperature and Salinity,
W79-01064 2K

Quantitative Determination of Quaternary Ammonium Bases (QAB) in Water and Wastewater by Thin Layer Chromatography,
W79-01070 5A

DEPURATION
Lag Adjustment Between Estimated and Actual Physiological Responses Conducted in Flow-Through Systems,
W79-01445 5C

DESALINATION
Solar-Assisted Still with Vapor-Compression Option,
W79-01126 3A

High-Temperature Solubilities of Calcium Sulfate Hemihydrate and Anhydrite in Natural Seawater Concentrates,
W79-01128 3A

Specification of Cellulose Acetate to be Used in Semipermeable Membranes,
W79-01129 3A

The Effect of Hydraulic Jump on the Performance of a Single-Stage Flash Evaporator,
W79-01238 3A

Solar-Assisted Distillation of Sea Water,
W79-01239 3A

The Role of Membrane Methods in the Desalination of Brackish Water,
W79-01343 3A

Induced Crystallization of Large Free Ice Crystals in Slowly Flowing Brine,
W79-01429 3A

DESALINATION APPARATUS
Solar-Assisted Still with Vapor-Compression Option,
W79-01126 3A

DESALINATION PLANTS
Solar-Assisted Distillation of Sea Water,
W79-01239 3A

DESALINATION PROCESSES
Cation-Exchange Column Behavior in a Desalination Process with Regenerant Recovery,
W79-01280 3A

Mixed-Bed Ion Exchange Desalting by the Calcium Hydroxide Process,
W79-01340 3A

DETRITUS
Fatty Acid Composition of Organic Detritus from Spartina Alterniflora,
W79-01332 5C

DEVILS LAKE BASIN (ND)
Impact of Floods and Alternative Flood Control Measures on the Devils Lake Basin Economy,
W79-01122 6B

DEWATERING
Electrochemical Purification of Wastewaters, Containing Polyester Resin (Elektrokhimicheskaya ochistka stochnykh vod, soderzhashchikh poliefirnuyu smolu),
W79-01066 5D

Water Content Reduction of Metal-Plating Waste Sludge by a Press and Centrifuge (Mekki suraji no kokaiteki dassui ni kansuru kisoteki kenkyu),
W79-01082 5E

An Assessment of Technology for Possible Utilization of Bayer Process Muds,
W79-01315 5D

The Dewatering of Lime-Algae Sludge on Sand Drying Beds,
W79-01349 5D

DIALYSIS
Donnan Dialysis Enrichment of Cations,
W79-01011 2K

DIALYSIS SAMPLER
A Chemical Budget of a Soft-Water Bog Lake: Benthic Contributions,
W79-01423 2H

DIAPAUSE
The Effect of Temperature on the Development of Diapausing and Subitaneous Eggs in Several Freshwater Copepods,
W79-01033 5C

DIAPTOMIDS
The Effect of Temperature on the Development of Diapausing and Subitaneous Eggs in Several Freshwater Copepods,
W79-01033 5C

DIBASOL
Effect of Dibasol and Vitamin B12 on the Larvae of Aurelia Aurita (Soyphoza) in a Reduced Saline Medium,
W79-01451 5C

DIFFUSION
Electrochemical Behavior of Rotating Iron Disks Effect of FE(111),
W79-01281 8G

DIGESTION
Effect of Mercuric Chloride on the Digestive System of a Teleost Fish, Channa Punctatus,
W79-01019 5C

DIPN
On the Pharmacological Effects of Diisopropylnaphthalene on Yellow-Tail (In Japanese),
W79-01450 5C

DIPTERA
A Biological Assessment of Fish and Benthic Populations Inhabiting a Kraft Mill Effluent Channel,
W79-01448 5C

DISCHARGE (WATER)
Floods from Breaching of Dams,
W79-01267 8B

The Case of the Shrinking Channels-The North Platte and Platte Rivers in Nebraska,
W79-01380 4A

DISINFECTION
Water Quality and Control of Plant Pathogens in Irrigation Reuse,
W79-01358 5D

DISPERSION
Role of Turbulent Mixing in the Dispersion of Pollutants at the Edge of a Large Lake,
W79-01199 5C

Mixing and Dispersion in Estuaries,
W79-01338 5B

DISSOLVED CHEMICAL CONSTITUENTS
Characteristics of Arizona Ponderosa Pine Stands on Sandstone Soils,
W79-01099 2I

DISSOLVED ORGANIC CARBON FLUXES
Dissolved Organic Carbon Fluxes in the Shetucket River of Eastern Connecticut, USA,
W79-01337 5C

DISSOLVED OXYGEN
Reaeration Performance of Stepped Cascades,
W79-01249 5G

Effect of Long-Term Reduction and Diel Fluctuation in Dissolved Oxygen on Spawning of Black Crappie, Pomoxis Nigromaculatus,
W79-01440 5C

DISSOLVED SOLIDS
Water Chemistry and the Reliability of Electronic Field Instruments,
W79-01333 5A

Dissolved-Solids Concentrations of Water in the Niagara Aquifer, Wisconsin,
W79-01369 7C

Dissolved-Solids Concentrations and Loads in Florida Surface Waters,
W79-01382 7C

DISSOLVED-SOLIDS CONCENTRATIONS
Dissolved-Solids Concentrations and Loads in Florida Surface Waters,
W79-01382 7C

DISSOLVED-SOLIDS DISCHARGE
Dissolved-Solids Concentrations and Loads in Florida Surface Waters,
W79-01382 7C

DISSOLVED-SOLIDS LOAD
Dissolved-Solids Concentrations and Loads in Florida Surface Waters,
W79-01382 7C

DISSOVED OXYGEN
Ammonia Production Rate and its Application to Fish Culture System Planning and Design,
W79-01465 5C

DISTILLATION
Solar-Assisted Still with Vapor-Compression Option,
W79-01126 3A

DISTRIBUTION PATTERNS
The Ecotone Between Spartina Foliosa Trin. and Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay: II. Soil Water and Salinity,
W79-01218 2L

The Ecotone Between Spartina Foliosa Trin. and Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay: III. Soil Aeration and Tidal Immersion,
W79-01283 2L

The Effect of Several Physical and Chemical Factors Upon the Distribution of Benthic Macroinvertebrates in Dunham Pond, Connecticut,
W79-01330 5C

DISTRICT HEATING
Energy Conservation: Is the Heat Storage Well the Key.,
W79-01228 4B

Heat Storage Wells Conserve Fuels,
W79-01230 4B

DIURNAL
The Effect of Dirunal Variation in Light and Temperature on the Acetylene Reduction Activity (N2 Fixation) of Subterranean Clover,
W79-01092 2I

DOMESTIC WASTES
A Biological Investigation of an Organically Polluted Urban Stream in Victoria,
W79-01016 5C

Waste-Water Treatment System,
W79-01420 5D

DONNAN DIALYSIS
Donnan Dialysis Enrichment of Cations,
W79-01011 2K

DRAINAGE
Evaluation of Design Methods of Subsurface Drainage Facilities for Highways,
W79-01061 4C

DRAINAGE CONTROL
Drainage Control to Diminish Nitrate Loss from Agricultural Fields,
W79-01137 5G

DRAINAGE EFFECTS
Warrior, Inc. V. Easterly (Developer Assessed Damages Caused by Excess Drainage Water and Debris Polluting Landowner's Pond,
W79-01192 6E

The Shift of Bog Vegetation Under the Influence of Drying,
W79-01304 2H

Hydrologic Impact of Land Drainage on Estuaries,
W79-01385 4A

DRAINAGE PRACTICES
Evaluation of Design Methods of Subsurface Drainage Facilities for Highways,
W79-01061 4C

DREDGE SPOILS
Transformations of Heavy Metals and Plant Nutrients in Dredged Sediments as Affected by Oxidation Reduction Potential and pH, Volume II: Materials and Methods/Results and Discussion,
W79-01201 5C

DREDGING
Transformations of Heavy Metals and Plant Nutrients in Dredged Sediments as Affected by Oxidation Reduction Potential and pH, Volume II: Materials and Methods/Results and Discussion,
W79-01201 5C

Removal and Separation of Spilled Hazardous Materials from Impoundment Bottoms,
W79-01307 5G

Self-Propelled Dredging Apparatus,
W79-01389 8C

DRIFT VELOCITY
Drift Velocity of Surface Films Over Waves,
W79-01139 5B

DRILLERS LOGS
Well Logs...Are They Really Necessary,
W79-01119 7C

DRILLING
Boring and Sampling Techniques,
W79-01103 8G

The Use of Inclined Boreholes for Well Development,
W79-01107 8B

Drilling Large Diameter Wells: The Proof is in the Planning,
W79-01110 8B

Regional Geology Series: Part X,
W79-01115 2F

The Expanding Geysers,
W79-01116 4B

DRILLING FLUIDS
Fluid Development for Drilling Sloughing and Heaving Shales,
W79-01104 8G

Mud and Clay,
W79-01120 8G

DRINKING WATER
A Pilot Study of Drinking Water Systems On and Along the National System of Interstate and Defense Highways.
W79-01312 5F

DRYING
About the Afforestation of Bogs in Tomsk Region,
W79-01305 2H

DUCKWEED
Effects of Chromium on Some Aquatic Plants,
W79-01031 5C

Cycling of Elements in Duckweed (Lemna Perpusilla) in an Ash Settling Basin and Swamp Drainage System,
W79-01458 5C

DUNES
Sand Transport Model of Barchan Dune Equilibrium,
W79-01043 2J

DYNAMIC MODELS
A Dynamic Water Quality Model of Lake Biwa - A Simulation Study of the Lake Eutrophication,
W79-01475 5C

DYNAMICS
Crops-Wide Conference on Computer-Aided Design in Structural Engineering, Volume XI: Earthquake and Dynamic Analyses,
W79-01057 8G

E. COLI
Biological Control Agents of Sewage Bacteria in Marine Habitats,
W79-01027 5C

The Effectiveness of Sand Filters for the Removal of Specific Viruses from Water Using Selected Cations as Filter Aids,
W79-01352 5D

EARTHQUAKE ENGINEERING
Crops-Wide Conference on Computer-Aided Design in Structural Engineering, Volume XI: Earthquake and Dynamic Analyses,
W79-01057 8G

EARTHQUAKES
Crops-Wide Conference on Computer-Aided Design in Structural Engineering, Volume XI: Earthquake and Dynamic Analyses,
W79-01057 8G

ECOLOGICAL DISTRIBUTION
Inland Mangroves and Water Chemistry, Barbuda, West Indies,
W79-01215 2K

Transplantation of Salt Marsh Vegetation. II. Georgetown, South Carolina,
W79-01306 2L

ECOLOGICAL MODELLING
Applying a Chemical Modelling Technique to Ecological Problems,
W79-01444 5B

ECOLOGY
An Ecological Study of a Baldcypress Swamp in St. Charles Parish, Louisiana,
W79-01226 2L

Interrelation of Forest and Bog.
W79-01297 2H

ECONOMIC DEVELOPMENT
Critique of the Challenges,
W79-01486 6B

ECONOMIC EFFECTS
Effects of Selected Changes in the Institutional and Human Environment Upon Output Per Unit of Input,
W79-01491 6B

ECONOMIC IMPACT
Impact of Floods and Alternative Flood Control Measures on the Devils Lake Basin Economy,
W79-01122 6B

Analysis of Economic Effect of Environmental Regulations on Integrated Iron and Steel Industry. Volume II,
W79-01194 5G

Water -- Demand and Supply: Economic Impacts,
W79-01482 6B

ECONOMIC VALUE
Economic Value of Hunting, Fishing, and General Rural Outdoor Recreation,
W79-01430 6B

ECONOMICS
Inland Wetland Definitions,
W79-01335 6E

Economic Value of Hunting, Fishing, and General Rural Outdoor Recreation,
W79-01430 6B

Viewpoint from the Capital Market,
W79-01488 6B

Critique and Challenges,
W79-01490 6B

Resource Extraction and Recycling with Environmental Costs,
W79-01492 6A

Computerized Costing Model for Inland Waterways Barge Transportation,
W79-01493 6A

Renewable Resource Management and Extinction,
W79-01495 6A

A Note on the Use of Taxes to Control Pollution,
W79-01496 5G

The 'Standards and Price' Approach to Pollution Control: Problems of Iteration,
W79-01497 5G

An Economic Evaluation of Cropland Use as a Control for Sediment Nonpoint Pollution,
W79-01498 5G

The Response of Firms to Pollution Charges,
W79-01499 5G

ECOTONE
The Ecotone Between Spartina Foliosa Trin. and Salicornia Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay, I. Biomass and Production,
W79-01217 2L

EDTA
Effects of Chelated Iron on the Growth of Two Species of Vallisneria,
W79-01446 5C

EFFECTS
Nitrogen and Phosphorus Fertilization of Aquatic Vascular Plants and Algae in Replicated Ponds. I. Initial Response to Fertilization,
W79-01224 5C

EFFLUENT STREAMS
Effluent Treatment Plant Cleans up Down the Valleys,
W79-01078 5D

EGG DEVELOPMENT
The Effect of Temperature on the Development of Diapausing and Subitaneous Eggs in Several Freshwater Copepods,
W79-01033 5C

ELECTRIC POWER PRODUCTION
Viewpoint from the Capital Market,
W79-01488 6B

ELECTROCHEMISTRY
Electrochemical Purification of Wastewaters, Containing Polyester Resin (Elektrokhimicheskaya oehistka stochnykh vod, soderzhashchikh poliefirnuyu smolu),
W79-01066 5D

Removal of Metallic Impurities from Water by Electrochemical Methods,
W79-01121 5D

Ion Exchange Membrane Methods for Continuous Removal of Ions from Water and Trace Chemical Analysis,
W79-01327 5A

ELECTRODIALYSIS
Polarization at Membrane/Solution Interfaces,
W79-01342 3A

The Role of Membrane Methods in the Desalination of Brackish Water,
W79-01343 3A

ELECTROLYSIS
Preparation of Copper Precipitate for Electrolytic Copper Recovery from Electroplating Industry Wastewater (Denki mekki kojo haisui kara no do no denkai kaishu o mokteki to shita do chinden no seisei hoho),
W79-01076 5D

Application of Packed Biopolar Cell to Electrolytic Treatment of Waste Waters, (In Japanese),
W79-01080 5D

Fixed-Bed Electrolysis - A Process for Purifying Waste Water Contaminated with Metals (Festbettelektrolyse - ein Verfahren zur Reinigung metallhaltiger Abwasser),
W79-01081 5D

Treatment of Electroplating Wastes by Reverse Osmosis,
W79-01320 5D

ELECTRON MICROSCOPY
Precision Analysis for Waterborne Chrysotile Asbestos by Transmission Electron Microscopy,
W79-01010 5A

ELECTRON SPIN RESONANCE
Electron Spin Resonance Analysis of Semiquinone Free Radicals of Aquatic and Soil Fulvic and Humic Acids,
W79-01133 5A

ELODEA
Methods of Contamination of Two Freshwater Food Chains by Cobalt 60: I. Direct Contamination of the Organisms by the Water (Modalites de la Contamination de Deux Chaines Trophiques Dulcaquicoles par le Cobalt 60: I. Contamination Directe des Organismes par L'Eau),
W79-01442 5C

ELUTRIATION
Nonmetallic Elutriation and Sieving Device for Benthic Macrofauna,
W79-01447 5G

EMBANKMENTS
A Probabilistic Analysis of Embankment Stability Problems,
W79-01054 8D

EMPETRUM NIGRUM
The Response of Empetrum Nigrum L. to Different Mire Water Regimes, with Special Reference to Wybunbury Moss, Cheshire and Featherbed Moss, Derbyshire,
W79-01293 5C

EMPLOYMENT
Regional - Implications - Overview of National Energy Employment Relations,
W79-01483 6B

ENDANGERED SPECIES
The Tennessee Valley Authority's Tellico Dam Project-Costs, Alternatives, and Benefits.
W79-01193 6B

ENERGY
Energy and the Colorado River,
W79-01167 3E

Legal and Institutional Planning for Macro-Conservation Measures,
W79-01227 6E

Conference Proceedings - A Critical Economic Balance, Water - Land - Energy - People - Held at Colorado State University, Pingree Park Campus on June 6-7, 1977,
W79-01478 6B

Coordinated Energy Management,
W79-01479 6B

The National Energy Plan,
W79-01480 6B

Water -- Demand and Supply: Economic Impacts,
W79-01482 6B

Regional - Implications - Overview of National Energy Employment Relations,
W79-01483 6B

The Industry's Role in Energy Management,
W79-01484 6B

Population Growth and Socio-Economic Balance: How to Visualize Alternative Futures,
W79-01485 6B

Critique and Challenges,
W79-01490 6B

ENERGY BUDGET (TAMARISK)
An Energy Budget Analysis of Evapotranspiration from Saltcedar,
W79-01231 3B

ENGINEERING STRUCTURES
Breakwater,
W79-01400 8A

ENGLAND
Dissolved Mercury in the Lake Windermere Catchment Area,
W79-01040 5B

ENTERIC VIRUSES
Ozonation for Control of Enteric Viruses in Sewage Effluent,
W79-01088 5D

ENTOMOLOGY
Aspects of the Life History and Growth of Acroneuria (Calineuria) Californica in a Sierra Foothill Stream,
W79-01125 2I

ENVIRONMENT
Fragile Lands and People,
W79-01487 6B

Critique and Challenges,
W79-01490 6B

ENVIRONMENTAL CONTROL
Metallic Mining Reclamation Act,
W79-01188 6E

ENVIRONMENTAL EFFECTS
Shell Structure of Immature Roman Snails (Helix Pomatia) After Exposure to P,P'-DDT,
W79-01020 5C

Abundance, Diversity, and Stability in Shore-Zone Fish Communities in an Area of Long Island Sound Affected by the Thermal Discharge of a Nuclear Power Station,
W79-01021 5C

The Tennessee Valley Authority's Tellico Dam Project-Costs, Alternatives, and Benefits.
W79-01193 6B

Great Blue Herons Respond to Nesting Habitat Loss,
W79-01432 6G

Waterfowl Collisions with Power Lines at a Coal-Fired Power Plant,
W79-01434 6G

Coal Development and Reclamation - Planning and Conservation,
W79-01489 6B

ENZYMES
Effect of Mercuric Chloride on the Digestive System of a Teleost Fish, Channa Punctatus,
W79-01019 5C

In Vitro Changes in the Activity of ATPases in the Gills of Carcinus Maenas Exposed to Various Concentrations of p,p'-DDT,
W79-01032 5C

EQUATIONS
Low-Flow Characteristics of Streams in the Rock-Fox River Basin, Wisconsin,
W79-01366 2E

EQUIPMENT
Self-Propelled Dredging Apparatus,
W79-01389 8C

EROSION
Simulation of Soil Erosion in the Palouse Praine of the Pacific Northwest,
W79-01087 4D

Effect of Mulching on Sediment in Runoff from Simulated Rainfall,
W79-01130 4D

Oak Leaf Country Club, Inc. v. Wilson (Flood Damage Caused by Channelization),
W79-01182 6E

EROSION CONTROL
Controlling Erosion Along Highways with Vegetation or Other Protective Cover,
W79-01059 4D

Guidelines for Mandatory Erosion Control Programs,
W79-01160 5G

Soil Erosion Control Policies - Institutional Alternatives and Costs,
W79-01164 5G

ESTIMATED COSTS
Cost Estimates for Construction of Publicly-Owned Wastewater Treatment Facilities. Volume 3. Summaries of Technical Data for Combined Sewer Overflows and Stormwater Discharge. 1976 Needs Survey,
W79-01308 5G

ESTIMATING
Annual Catchment Losses-A Practical Method,
W79-01248 2D

Quantification of Recreational Use of the Coralville Reservoir,
W79-01361 6B

ESTUARIES
Trace Metal Enhancement in the Biotic and Abiotic Components of an Estuarine Tidal Front,
W79-01046 5B

Limnological Characteristics of the Potomac Estury,
W79-01195 5C

Hydrologic Impact of Land Drainage on Estuaries,
W79-01385 4A

Standing Crops of Marsh Vegetation of Two Tributaries of Chesapeake Bay,
W79-01433 2L

ESTUARIES *MIXING
Mixing and Dispersion in Estuaries,
W79-01338 5B

ESTUARINES
Metals from Urban Runoff in Dated Sediments of a Very Shallow Estuary,
W79-01251 5A

EUTROPHICATION
The Effects of Land Use on Phosphorus Loading: A Case Study - Six Mile Run Reservoir,
W79-01086 5C

Limnological Characteristics of the Potomac Estury,
W79-01195 5C

Persistent Blooms of Surf Diatoms Along the Northwest Coast,
W79-01200 5C

Quaboag and Quacumquasit Ponds, Water Quality Study, April 1974-April 1975,
W79-01202 5C

A Dynamic Water Quality Model of Lake Biwa - A Simulation Study of the Lake Eutrophication,
W79-01475 5C

Nutrient Recovery from Farm Ponds: Hydroponic Plant Production and Other Means, a Review,
W79-01477 5C

EVACUATION
Rules and Procedure for Coastal Construction and Excavation.
W79-01186 6E

EVALUATION
A Water Well Evaluation System,
W79-01102 8B

Impact of Floods and Alternative Flood Control Measures on the Devils Lake Basin Economy,
W79-01122 6B

Federal Water Pollution Control Act Amendments of 1977 (Part 6, New Orleans, LA.).
W79-01169 6E

Oil Pollution Liability.
W79-01173 6E

A Manual for the Evaluation of a State Drinking Water Supply Program,
W79-01313 5F

EVALUATION ANALYSIS
Federal Water Pollution Control Act Amendments of 1977 (Part 9, Washington, D.C.).
W79-01171 6E

EVAPORATION
Renovation of Industrial Inorganic Wastewater by Evaporation with Interface Enhancement,
W79-01319 5D

EVAPORATORS
The Effect of Hydraulic Jump on the Performance of a Single-Stage Flash Evaporator,
W79-01238 3A

EVAPOTRANSPIRATION
An Energy Budget Analysis of Evapotranspiration from Saltcedar,
W79-01231 3B

Annual Catchment Losses-A Practical Method,
W79-01248 2D

EXPLOITATION
Seabed Resources and International Law,
W79-01158 6E

In Search of Common Nodules at UNCLOS III,
W79-01163 6E

EXPLOSIONS
Acute Effects of Underwater Construction Blasting on Fishes in Long Point Bay, Lake Erie,
W79-01452 5C

EXPLOSIVES
Toxicity and Mutagenicity of 2,4,6-Trinitrotoluene and Its Microbial Metabolites,
W79-01012 5C

State-of-the-Art: Military Explosives and Propellants Production Industry, Vol. III -- Wastewater Treatment,
W79-01318 5D

EXTINCTION
Renewable Resource Management and Extinction,
W79-01495 6A

FALLOUT
Parameterization of Sulfate Removal by Precipitation,
W79-01038 5B

The Slope of Gran's Plot: A Useful Function in the Examination of Precipitation, the Water-Soluble Part of Airborne Particles, and Lake Water,
W79-01474 5A

FARM PONDS
Nutrient Recovery from Farm Ponds: Hydroponic Plant Production and Other Means, a Review,
W79-01477 5C

FARM WASTES
Effect of Soil Application of Dairy Manure on Germination and Emergence of Some Selected Crops,
W79-01236 5C

Effect of Beef-Feedlot-Lagoon Water on Soil Chemical Properties and Growth and Composition of Corn Forage,
W79-01290 5C

Automated Treatment and Recycle of Swine Feedlot Wastewaters,
W79-01316 5D

FATTY-ACID
Fatty Acid Composition of Organic Detritus from Spartina Alterniflora,
W79-01332 5C

FEDERAL GOVERNMENT
The Fox in the Chicken Coop: The Regulatory Program of the U.S. Army Corps of Engineers,
W79-01141 6E

Coastal Planning: The Designation and Management of Areas of Critical Environmental Concern,
W79-01152 5G

Up to Our Wastes in Wet Suits: The Federal Law on Water Pollution,
W79-01161 5G

Federal Water Pollution Control Act Amendments of 1977 (Part 6, New Orleans, LA.).
W79-01169 6E

Federal Water Pollution Control Act Amendments of 1977 (Appendix, Statements Submitted for the Record).
W79-01172 6E

Oil Pollution Liability.
W79-01173 6E

Inclusion of Alaska Lands in National Park, Forest, Wildlife Refuge, and Wild and Scenic Rivers Systems (Part II, Washington, D.C.).
W79-01177 6E

Inclusion of Alaska Lands in Natl. Park, Forest, Wildlife Refuge, and Wild and Scenic Rivers Systems (Part V, Atlanta, GA.).
W79-01178 6E

Inclusion of Alaska Lands in Natl. Park, Forest Wildlife Refuge and Wild and Scenic Rivers Systems (Part XII, Fairbanks, Alaska).
W79-01179 6E

Equitable Recovery of Industrial Waste Treatment Costs in Municipal Systems, Federal Guidelines.
W79-01206 5D

The National Energy Plan,
W79-01480 6B

Water -- Demand and Supply: Economic Impacts,
W79-01482 6B

FEDERAL JURISDICTION
Federal Common Law and Ocean Pollution: A Private Remedy for Oil Pollution Damage,
W79-01150 5G

FEDERAL WATER POLLUTION CONTROL ACT
Problems in Attempting to Translate Statutory Standards into Emission Limitations Under Air and Water Pollution Control Legislation,
W79-01151 5G

Thermal Discharges and Power Plant Intakes: Section 316 in Perspective,
W79-01159 5G

Guidelines for Mandatory Erosion Control Programs,
W79-01160 5G

Up to Our Wastes in Wet Suits: The Federal Law on Water Pollution,
W79-01161 5G

A Comparison of Bethlehem Steel Corp V. Train with Republic Steel Corp. V. Train: The Sixth Circuit,
W79-01162 5G

Federal Water Pollution Control Act Amendments of 1977 (Part 6, New Orleans, LA.).
W79-01169 6E

Federal Water Pollution Control Act Amendments of 1977 (Part 7, Burlington, VT.).
W79-01170 6E

Federal Water Pollution Control Act Amendments of 1977 (Part 9, Washington, D.C.).
W79-01171 6E

Federal Water Pollution Control Act Amendments of 1977 (Appendix, Statements Submitted for the Record).
W79-01172 6E

FEEDLOTS
Effect of Beef-Feedlot-Lagoon Water on Soil Chemical Properties and Growth and Composition of Corn Forage,
W79-01290 5C

FEEDS
Fresh-Water Weeds are a Resource,
W79-01197 5C

FERMENTATION
Synthesis of Optimal Feedback Control Systems for Fermentations and Biological Waste Treatment Processes,
W79-01428 5D

FERROUS IRON
A Chemical Budget of a Soft-Water Bog Lake: Benthic Contributions,
W79-01423 2H

FERTILIZATION
Fertilizing Fish Ponds: I. Chemistry of the Waters,
W79-01286 5C

Nitrogen Fertilization of Ponds,
W79-01439 5C

FERTILIZERS
Extraction of Ammonium Ions from Wastewaters Generated in the Production of Compound Fertilizers and Their Utilization by Ion-Exchange Method (Izvlechenie ionov ammoniya iz stochnykh vod proizvodsty slozhnykh udobrenii ikh utilizatsiya metodom ionnogo obmena),
W79-01068 5D

Field Study of Solute Movement in a Highly Aggregated Oxisol with Intermittent Flooding: I. Nitrate,
W79-01360 3F

FILTERS
Water Content Reduction of Metal-Plating Waste Sludge by a Press and Centrifuge (Mekki suraji no koksaiteki dassui ni kansuru kisoteki kenkyu),
W79-01082 5E

FILTRATION
Extraction of Ammonium Ions from Wastewaters Generated in the Production of Compound Fertilizers and Their Utilization by Ion-Exchange Method (Izvlechenie ionov ammoniya iz stochnykh vod proizvodsty slozhnykh udobrenii ikh utilizatsiya metodom ionnogo obmena),
W79-01068 5D

Wastewater Treatment in the Sugar Industry (II) (Abwasseraufbereitung der Zuckerwarenindustrie (II)).
W79-01072 5D

Removal and Separation of Spilled Hazardous Materials from Impoundment Bottoms,
W79-01307 5G

FINANCING
Viewpoint from the Capital Market,
W79-01488 6B

FINITE ELEMENT ANALYSIS
Parameter Identification in an Inhomogeneous Medium with Finite Element Method,
W79-01341 2F

FISH
Exceptional Tolerance to Low pH of some Tropical Blackwater Fish,
W79-01098 5C

FISH BEHAVIOR
The Behavior of Juvenile Atlantic Salmon (Salmo Salar) and Brook Trout (Salvelinus Fontinalis) with Regard to Temperature and to Water Velocity,
W79-01441 5C

FISH CULTURE
Mortalities of Pen-Reared Salmon Associated with Blooms of Marine Algae,
W79-01462 5C

FISH DISEASES
On the Pharmacological Effects of Diisopropylnaphthalene on Yellow-Tail (In Japanese),
W79-01450 5C

FISH ESTABLISHMENT
Waste Heat Aquaculture,
W79-01467 5C

FISH FARMING
Ammonia Production Rate and its Application to Fish Culture System Planning and Design,
W79-01465 5C

Waste Heat Aquaculture,
W79-01467 5C

FISH HATCHERIES
Pollution Abatement Facilities at National Fish Hatcheries,
W79-01463 5G

Ammonia Production Rate and its Application to Fish Culture System Planning and Design,
W79-01465 5C

FISH HATCHERY
Evaluation of Clinoptilolite for Ammonia Removal,
W79-01464 5D

FISH LADDERS
Fish Ladder for Charles River Dam, Charles River, Massachusetts, Hydraulic Model Investigation,
W79-01052 8I

FISH PHYSIOLOGY
Influence of Temperature on Growth Promotion and Body Composition of Carp (Cyprinus Carpio) Due to Bovine Growth Hormone,
W79-01438 5C

FISH PONDS
Fertilizing Fish Ponds: I. Chemistry of the Waters,
W79-01286 5C

FISH POPULATIONS
Impact of Mine Drainage on a Mountain Stream in Pennsylvania,
W79-01017 5C

FISH PRODUCTION
Ammonia Production Rate and its Application to Fish Culture System Planning and Design,
W79-01465 5C

FISHERIES RESOURCES
The Impact of Logging on Salmonid Resources in the Pacific Northwest,
W79-01466 4C

FISHKILL
Acute Effects of Underwater Construction Blasting on Fishes in Long Point Bay, Lake Erie,
W79-01452 5C

FLASH EVAPORATION
The Effect of Hydraulic Jump on the Performance of a Single-Stage Flash Evaporator,
W79-01238 3A

FLASH FLOODS
Colorado Big Thompson Flood: Geologic Evidence of a Rare Hydrologic Event,
W79-01047 2E

FLOCCULATION
Electrochemical Purification of Wastewaters, Containing Polyester Resin (Elektrokhimicheskaya ochistka stochnykh vod, soderzhashchikh poliefirnuyu smolu),
W79-01066 5D

Fluoride Removal from Potable Water Supplies,
W79-01351 5F

FLOOD DAMAGE
Meeker v. City of Clinton (Flood Damages Caused by Municipal and Railroad Negligence),
W79-01181 6E

Oak Leaf Country Club, Inc. v. Wilson (Flood Damage Caused by Channelization),
W79-01182 6E

FLOOD FORECASTING
The Development and Testing of a Dam-Break Flood Forecasting Model,
W79-01270 8B

FLOOD PLAIN ZONING
Proposed (Guideline Model) Coastal and Riverine Flood Plain Zoning Ordinance,
W79-01147 6F

FLOOD PROFILES
Flood Plain Inundation Caused by Dam Failure,
W79-01265 8B

FLOOD RECURRENCE INTERVAL
Colorado Big Thompson Flood: Geologic Evidence of a Rare Hydrologic Event,
W79-01047 2E

FLOOD ROUTING
Proceedings of Dam-Break Flood Routing Model Workshop.
W79-01262 8B

Flood Plain Inundation Caused by Dam Failure,
W79-01265 8B

Simplified Routing through Reservoir,
W79-01266 4A

Floods from Breaching of Dams,
W79-01267 8B

A Simulation of the Hydraulic Events During and Following the Teton Dam Failure,
W79-01269 8B

The Development and Testing of a Dam-Break Flood Forecasting Model,
W79-01270 8B

Calculating and Routing the Teton Dam-Break Flood,
W79-01271 8B

Qualitative Comparison of Three Dam Break Routing Models,
W79-01273 8B

Dam-Break Flood Wave Computation by Method of Characteristics and Linearized Implicit Schemes,
W79-01274 8B

Dam Break Flood Wave Analysis: Problems, Pitfalls, and Partial Solutions,
W79-01276 8B

Simulation of Dam Break Flooding Under Normal and Probable Maximum Flood Conditions,
W79-01277 8B

FLOOD WAVES
The Dam-Break Wave and the Bore Collapse on a Beach,
W79-01263 8B

Unsteady Flow Modeling of Dam-Break Waves,
W79-01268 8B

Comparative Analysis of Routing Techniques for the Floodwave from a Ruptured Dam,
W79-01272 8B

Qualitative Comparison of Three Dam Break Routing Models,
W79-01273 8B

Dam-Break Flood Wave Computation by Method of Characteristics and Linearized Implicit Schemes,
W79-01274 8B

A Numerical Model for Multidimensional Unconstrained Flow Over Irregular Terrain,
W79-01275 8B

FLOODING (INTERMITTENT)
Field Study of Solute Movement in a Highly Aggregated Oxisol with Intermittent Flooding: I. Nitrate,
W79-01360 3F

FLOODS
Simulation of Flood Waves in Channels,
W79-01060 2E

Criteria for Routing the Dam-Break Flood,
W79-01278 8B

FLORAL LISTS
Additions to the Freshwater Algae of South Carolina,
W79-01203 5C

FLORIDA
Rules and Procedure for Coastal Construction and Excavation.
W79-01186 6E

The Effect of Fire on Species Composition in Cypress Dome Ecosystems,
W79-01292 4C

Runoff from Hydrologic Units in Florida,
W79-01368 7C

Water Resources Data for Florida, Water Year 1977--Volume 2A: Southern Florida, Surface Water.
W79-01370 7C

Water Resources Data for Florida, Water Year 1977--Volume 2B: Southern Florida, Ground Water.
W79-01371 7C

Water Resources Data for Florida, Water Year 1977--Volume 1: Northeast Florida.
W79-01373 7C

Chemical Quality of Water Used for Municipal Supply in Florida, 1975,
W79-01375 7C

Program for Monitoring Surface-Water Quality in Florida,
W79-01376 7C

Dissolved-Solids Concentrations and Loads in Florida Surface Waters,
W79-01382 7C

Hydrogeologic Maps of a Flood Detention Area Proposed by Southwest Florida Water Management District Green Swamp Area, Florida,
W79-01383 7C

FLORIDA AQUIFER
Hydrogeologic Maps of a Flood Detention Area Proposed by Southwest Florida Water Management District Green Swamp Area, Florida,
W79-01383 7C

FLOW FRICTION
Analytic Solutions for Computer Flow Model Testing,
W79-01256 2L

FLOW MEASUREMENT
Drift Velocity of Surface Films Over Waves,
W79-01139 5B

FLUORAPATITE
Fluoride Removal from Potable Water Supplies,
W79-01351 5F

FLUORIDES
Fluoride Removal from Potable Water Supplies,
W79-01351 5F

FLUORINE
Injurious Effect of Tap Water on Rooting of Cuttings of Bryophyllum Calycinum,
W79-01221 5C

FLY ASH
Feasibility Study, Fly Ash Reclamation of Surface Mines, Hillman State Park, Feasibility Study,
W79-01323 5G

Cycling of Elements in Duckweed (Lemna Perpusilla) in an Ash Settling Basin and Swamp Drainage System,
W79-01458 5C

FOG
Heat and Thrust Requirements of a Thermal Fog Dispersal System,
W79-01058 3B

FOOD CHAINS
Total Mercury and Methyl Mercury Contents in Fish from Lake Paijanne,
W79-01028 5C

Methods of Contamination of Two Freshwater Food Chains by Cobalt 60: I. Direct Contamination of the Organisms by the Water (Modalites de la Contamination de Deux Chaines Trophiques Dulcaquicoles par le Cobalt 60: I. Contamination Directe des Organismes par L'Eau),
W79-01442 5C

Experimental Study on the Concentration Process of Trace Element Through a Food Chain from the Viewpoint of Nutrition Ecology,
W79-01461 5B

FOOD HABITS
A Biological Assessment of Fish and Benthic Populations Inhabiting a Kraft Mill Effluent Channel,
W79-01448 5C

Importance of Algae in the Diet of the Oligochetes Lumbriculus Variegatus (Muller) and Rhyacodrilus Sodalis (Eisten),
W79-01453 5C

FOOD PROCESSING INDUSTRY
Wastewater Problems in the Food Processing Industry in the Light of Modern Water Management (Az elelmiszeripar szennyviz-problemai a korszeru vizgazdalkodas tukreben),
W79-01071 5D

Wastewater Treatment in the Sugar Industry (II) (Abwasseraufbereitung der Zuckerwarenindustrie (II)).
W79-01072 5D

Determination of the Bichromate Oxidizability of Sugar Factory Effluents (Opredelenie bikhromatnoy okislyaemosti stochnykh vod sakharnogo zavoda),
W79-01074 5A

Sewage from the Yeast Industry: Its Nature and Its Purification (Abwasser der Hefeindustrie, Beschaffenheit und Reinigung),
W79-01075 5D

Effects of Industrial Wastewater Effluents on Water Quality in Gibson Cove and Kodiak Harbor, Kodiak, Alaska, August 26-29, 1974.
W79-01437 5C

Water Quality Investigation Related to Seafood Processing Wastewater Discharges at Dutch Harbor, Alaska, October 1975, October 1976,
W79-01469 5C

FOOD WEBS
Chlorinated Hydrocarbons in Marine Insects,
W79-01023 5B

FORECASTING
Population Growth and Socio-Economic Balance: How to Visualize Alternative Futures,
W79-01485 6B

FOREST WATERSHEDS
Tap Water and Timber - The Costs of Multiple Use,
W79-01166 5G

FORESTS
Interrelation of Forest and Bog.
W79-01297 2H

FOSSIL FUELS
Cycling of Elements in Duckweed (Lemna Perpusilla) in an Ash Settling Basin and Swamp Drainage System,
W79-01458 5C

FREEZING PROCESSES
Induced Crystallization of Large Free Ice Crystals in Slowly Flowing Brine,
W79-01429 3A

FRESHWATER FISH
Total Mercury and Methyl Mercury Contents in Fish from Lake Paijanne,
W79-01028 5C

FROGS
Can Salamanders and Frogs Survive the Threat of Acid Precipitation,
W79-01005 5C

FUEL OIL
The Toxic Effects of the Water Soluble Fractions of No. 2 Fuel Oil and Three Aromatic Hydrocarbons on the Behavior and Survival of Barnacle Larvae,
W79-01025 5C

FUTURE PLANNING (PROJECTED)
Population Growth and Socio-Economic Balance: How to Visualize Alternative Futures,
W79-01485 6B

GAMMA RAYS
Chronic Exposure of Chinook Salmon Eggs and Alevins to Gamma Irradiation: Effects on Their Return to Freshwater as Adults,
W79-01455 5C

GAS-DRIVEN PUMP
Gas-Driven Pump for Ground-Water Supplies,
W79-01378 8C

GATE CONTROL
Control of Transients in Series Channel with Gates,
W79-01255 8B

GATE STROKING
Control of Transients in Series Channel with Gates,
W79-01255 8B

GEOCHEMISTRY
Seasonal Variation in Pco2 and C-13 Content of Soil Atmosphere,
W79-01387 2F

GEOGRAPHICAL REGIONS
Runoff from Hydrologic Units in Florida,
W79-01368 7C

GEOLOGIC INVESTIGATIONS
Colorado Big Thompson Flood: Geologic Evidence of a Rare Hydrologic Event,
W79-01047 2E

GEOLOGY
Regional Geology Series: Part X,
W79-01115 2F

Ground-Water Resources and Geology of Columbia County, Wisconsin,
W79-01384 2F

GEOMORPHOLOGY
Geomorphologic Characteristics of Fourteen Indiana Watersheds Obtained from a Computer Data Bank of Stream Networks,
W79-01426 4D

GEORGIA
The Okefenokee Swamp Watershed: Water Balance and Nutrient Budgets,
W79-01211 2H

GEOTHERMAL STUDIES
Scaling and Corrosion in an Experimental Geothermal Power Plants,
W79-01106 3C

The Expanding Geysers,
W79-01116 4B

Investigation of Heat Transfer Coefficients of Working Fluids in Geothermal Power Cycles,
W79-01279 4B

GERMINATION
Effect of Soil Application of Dairy Manure on Germination and Emergence of Some Selected Crops,
W79-01236 5C

GOALS
Critique of the Challenges,
W79-01486 6B

Critique and Challenges,
W79-01490 6B

GRAN'S PLOT
The Slope of Gran's Plot: A Useful Function in the Examination of Precipitation, the Water-Soluble Part of Airborne Particles, and Lake Water,
W79-01474 5A

GRANTS
How to Obtain Federal Grants to Build Municipal Wastewater Treatment Works.
W79-01210 5G

GRAPHICAL METHODS
Reconciliation of Apparent Nonequivalence Among Alternative Rating Methods,
W79-01240 6B

GRASS SHRIMP
The Influence of Temperature and Salinity on the Toxicity of Hexavalent Chromium to the Grass Shrimp Palaemonetes Pugio (Holthuis),
W79-01457 5C

GREAT BLUE HERON
Great Blue Herons Respond to Nesting Habitat Loss,
W79-01432 6G

GREAT BRITAIN
Characteristics of Rainfall Conditions with Particular Reference to North East England,
W79-01247 2B

GREAT PLAINS
Conference Proceedings - A Critical Economic Balance, Water - Land - Energy - People - Held at Colorado State University, Pingree Park Campus on June 6-7, 1977,
W79-01478 6B

Fragile Lands and People,
W79-01487 6B

GREAT SALT LAKE
The Microbial Ecology of the Great Salt Lake North Arm,
W79-01346 5C

The MicroBial Ecology of the Great Salt Lake,
W79-01347 5C

GREEN SWAMP AREA (FLA)
Hydrogeologic Maps of a Flood Detention Area Proposed by Southwest Florida Water Management District Green Swamp Area, Florida,
W79-01383 7C

GROUND WATER
Regional Geology Series: Part X,
W79-01115 2F

Groundwater Law: More Questions Than Answers,
W79-01118 6E

GROUNDWATER
Transmissivity and Hydraulic Conductivity of Saturated Sedimentary Rocks in the Hanford Reservation,
W79-01053 8B

Characteristics of Incinerator Residue and the Effect of its Leachate on Groundwater Quality,
W79-01090 5B

A Nonstructural Approach to Control Salt Accumulation in Ground Water,
W79-01132 5B

Water Resources of the Upper Henrys Fork Basin in Eastern Idaho.
W79-01364 6D

Land Subsidence in the Santa Clara Valley,
W79-01365 2F

Dissolved-Solids Concentrations of Water in the Niagara Aquifer, Wisconsin,
W79-01369 7C

Water Resources Data for Florida, Water Year 1977--Volume 2B: Southern Florida, Ground Water.
W79-01371 7C

Water Resources Data for New Hampshire and Vermont, Water Year 1977.
W79-01372 7C

Water Resources Data for Florida, Water Year 1977--Volume 1: Northeast Florida.
W79-01373 7C

Gas-Driven Pump for Ground-Water Supplies,
W79-01378 8C

GROUNDWATER AGE

Trichlorofluoromethane, a New Hydrologic Tool for Tracing and Dating Ground Water,
W79-01422 2F

GROUNDWATER MOVEMENT

Trichlorofluoromethane, a New Hydrologic Tool for Tracing and Dating Ground Water,
W79-01422 2F

GROUNDWATER RECHARGE

Hydrogeologic Maps of a Flood Detention Area Proposed by Southwest Florida Water Management District Green Swamp Area, Florida,
W79-01383 7C

Seasonal Variation in Pco2 and C-13 Content of Soil Atmosphere,
W79-01387 2F

GROUNDWATER RESOURCES

The Management of Groundwater Supplies,
W79-01117 4B

Well Logs...Are They Really Necessary,
W79-01119 7C

State Approach to Groundwater Quality Protection: The Illinois Experience,
W79-01156 5G

Probable Yields of Wells in the Niagara Aquifer, Wisconsin,
W79-01367 7C

Ground-Water Resources and Geology of Columbia County, Wisconsin,
W79-01384 2F

GROWTH HORMONES

Influence of Temperature on Growth Promotion and Body Composition of Carp (Cyprinus Carpio) Due to Bovine Growth Hormone,
W79-01438 5C

GROWTH RATES

Effect of DDT and Polychlorinated Biphenyls on Cell Population Growth of Crithidia Fasciculata, A Flagellated Protozoan,
W79-01013 5C

The Feasibility of Suspension Culture of Oysters (Crassostrea Virginica) at a Petroleum Platform off the Texas Coast,
W79-01024 5C

Suspension-Feeding Aquaculture Systems: Effects of Phytoplankton Concentration and Temperature on Growth of the Bay Scallop,
W79-01285 5C

Growth and Mortality of Littorina Irrorata Say in Three North Carolina Marshes,
W79-01289 2L

Influence of Temperature on Growth Promotion and Body Composition of Carp (Cyprinus Carpio) Due to Bovine Growth Hormone,
W79-01438 5C

GULF COAST

Transformations of Heavy Metals and Plant Nutrients in Dredged Sediments as Affected by Oxidation Reduction Potential and pH, Volume II: Materials and Methods/Results and Discussion,
W79-01201 5C

GULF OF MEXICO

Transformations of Heavy Metals and Plant Nutrients in Dredged Sediments as Affected by Oxidation Reduction Potential and pH, Volume II: Materials and Methods/Results and Discussion,
W79-01201 5C

GULLS

Gull Droppings and Their Effects on Water Quality,
W79-01041 5B

HABITATS

Habitat Use and Home Range of Mallards Breeding in Minnesota,
W79-01287 2I

Stream Channelization Impacts on Songbirds and Small Mammals in Vermont,
W79-01431 6G

HAIL

The Relationship Between Radar Reflectivity Factor and Hail at the Ground for Northeast Colorado Thunderstorms,
W79-01037 7B

HALOBATES

Chlorinated Hydrocarbons in Marine Insects,
W79-01023 5B

HANFORD RESERVATION (WASH)

Transmissivity and Hydraulic Conductivity of Saturated Sedimentary Rocks in the Hanford Reservation,
W79-01053 8B

HARVESTING

Fresh-Water Weeds are a Resource,
W79-01197 5C

HAWAII

The Water Factor in the Social History of Honolulu, Hawaii,
W79-01353 6B

HAZARDS

The Impact of Hazardous Wastes on Ground Water: Part II,
W79-01113 5B

HEAT TRANSFER

Energy Conservation: Is the Heat Storage Well the Key.,
W79-01228 4B

Heat Storage Wells Conserve Fuels,
W79-01230 4B

Investigation of Heat Transfer Coefficients of Working Fluids in Geothermal Power Cycles,
W79-01279 4B

HEAT TRANSMISSION

Legal and Institutional Planning for Macro-Conservation Measures,
W79-01227 6E

Energy Conservation: Is the Heat Storage Well the Key.,
W79-01228 4B

Heat Storage Wells Conserve Fuels,
W79-01230 4B

HEATINGM

Legal and Institutional Planning for Macro-Conservation Measures,
W79-01227 6E

HEAVY METAL COMPOUNDS

Removal of Metallic Impurities from Water by Electrochemical Methods,
W79-01121 5D

HEAVY METAL REMOVAL

Differential Bed Kinetic Analysis of Heavy Metal Removals by Biological Slimes,
W79-01314 5D

HEAVY METALS

Photo-Decomposition of Aqueous Solutions of Phenol (Fenooru suiyoeki no hikari bunkai),
W79-01069 5D

Fixed-Bed Electrolysis - A Process for Purifying Waste Water Contaminated with Metals (Festbettelektrolyse - ein Verfahren zur Reinigung metallhaltiger Abwasser),
W79-01081 5D

Removal of Metallic Impurities from Water by Electrochemical Methods,
W79-01121 5D

Heavy Metal Accumulation and its Effect on the Biota of an Industrial Settling Pond,
W79-01124 5D

Cadmium Availability to Rice in Sludge-Amended Soil Under 'Flood' and 'Nonflood' Culture,
W79-01127 5E

Urban Runoff Pollution and Water Quality Planning,
W79-01134 5B

Transformations of Heavy Metals and Plant Nutrients in Dredged Sediments as Affected by Oxidation Reduction Potential and pH, Volume II: Materials and Methods/Results and Discussion,
W79-01201 5C

Metals from Urban Runoff in Dated Sediments of a Very Shallow Estuary,
W79-01251 5A

Differential Bed Kinetic Analysis of Heavy Metal Removals by Biological Slimes,
W79-01314 5D

Method for Removing of Multivalent Heavy Metals from Metal Plating Waste Effluents,
W79-01415 5D

HELIX POMATIA

Shell Structure of Immature Roman Snails (Helix Pomatia) After Exposure to P,P'-DDT,
W79-01020 5C

HELLS CANYON

Analysis of Water Flow Problems in the Hells Canyon of the Snake River,
W79-01359 4A

HERRING
Chlorine effects on Larval Development of Striped Bass (Morone Saxatilis), White Perch (M. Americana) and Blueback Herring (Alosa Aestivalis),
W79-01456 5C

HIGHWAY CONSTRUCTION
Highway Construction Impact on Water-Supply Lakes,
W79-01260 4C

HIGHWAYS
Controlling Erosion Along Highways with Vegetation or Other Protective Cover,
W79-01059 4D

Evaluation of Design Methods of Subsurface Drainage Facilities for Highways,
W79-01061 4C

Highway Construction Impact on Water-Supply Lakes,
W79-01260 4C

HISTORY
The Water Factor in the Social History of Honolulu, Hawaii,
W79-01353 6B

HOME RANGES
Habitat Use and Home Range of Mallards Breeding in Minnesota,
W79-01287 2I

HORMONES
Influence of Temperature on Growth Promotion and Body Composition of Carp (Cyprinus Carpio) Due to Bovine Growth Hormone,
W79-01438 5C

HUMAN POPULATION
Population Growth and Socio-Economic Balance: How to Visualize Alternative Futures,
W79-01485 6B

HUMAN RESOURCES
Regional - Implications - Overview of National Energy Employment Relations,
W79-01483 6B

Population Growth and Socio-Economic Balance: How to Visualize Alternative Futures,
W79-01485 6B

HUMATES
Electron Spin Resonance Analysis of Semiquinone Free Radicals of Aquatic and Soil Fulvic and Humic Acids,
W79-01133 5A

HUNTING
Non-Resident Hunters--Benefactors or Bad Men.
W79-01138 6B

Economic Value of Hunting, Fishing, and General Rural Outdoor Recreation,
W79-01430 6B

HYDRAULIC CONDUCTIVITY
Transmissivity and Hydraulic Conductivity of Saturated Sedimentary Rocks in the Hanford Reservation,
W79-01053 8B

HYDRAULIC JUMP
The Effect of Hydraulic Jump on the Performance of a Single-Stage Flash Evaporator,
W79-01238 3A

HYDRAULIC MODELS
Fish Ladder for Charles River Dam, Charles River, Massachusetts, Hydraulic Model Investigation,
W79-01052 8I

Reaeration Performance of Stepped Cascades,
W79-01249 5G

HYDRAULIC TRANSIENTS
Control of Transients in Series Channel with Gates,
W79-01255 8B

HYDROELECTRIC POWER
Analysis of Water Flow Problems in the Hells Canyon of the Snake River,
W79-01359 4A

HYDROGEN
Hydrogen Recovery from Purge Gas of Ammonia Plants,
W79-01067 5D

HYDROGEN ION CONCENTRATION
Exceptional Tolerance to Low pH of some Tropical Blackwater Fish,
W79-01098 5C

Transformations of Heavy Metals and Plant Nutrients in Dredged Sediments as Affected by Oxidation Reduction Potential and pH, Volume II: Materials and Methods/Results and Discussion,
W79-01201 5C

Effect of Acid Mine Drainage on the pH of Lake Toya, Japan,
W79-01258 5B

An Automated Procedure for the Simultaneous Determination of Specific Conductance and pH in Natural Water Samples,
W79-01374 2K

HYDROGEN SULFIDE
The Response of Empetrum Nigrum L. to Different Mire Water Regimes, with Special Reference to Wybunbury Moss, Cheshire and Featherbed Moss, Derbyshire,
W79-01293 5C

HYDROGEOLOGY
Land Subsidence in the Santa Clara Valley,
W79-01365 2F

Digital-Model Simulation of the Glacial-Outwash Aquifer, Otter Creek-Dry Creek Basin, Cortland County, New York,
W79-01377 2F

Hydrogeologic Maps of a Flood Detention Area Proposed by Southwest Florida Water Management District Green Swamp Area, Florida,
W79-01383 7C

Ground-Water Resources and Geology of Columbia County, Wisconsin,
W79-01384 2F

HYDROGRAPH ANALYSIS
Simplified Routing through Reservoir,
W79-01266 4A

HYDROGRAPHS
Characteristics of Rainfall Conditions with Particular Reference to North East England,
W79-01247 2B

Criteria for Routing the Dam-Break Flood,
W79-01278 8B

HYDROLOGIC BUDGET
The Okefenokee Swamp Watershed: Water Balance and Nutrient Budgets,
W79-01211 2H

HYDROLOGIC CYCLE
Hydrology of the Nevin Wetland Near Madison, Wisconsin,
W79-01213 2H

HYDROLOGIC DATA
Water Resources Data for Florida, Water Year 1977--Volume 2A: Southern Florida, Surface Water.
W79-01370 7C

Water Resources Data for Florida, Water Year 1977--Volume 2B: Southern Florida, Ground Water.
W79-01371 7C

Water Resources Data for New Hampshire and Vermont, Water Year 1977.
W79-01372 7C

Water Resources Data for Florida, Water Year 1977--Volume 1: Northeast Florida.
W79-01373 7C

Water-Resources Investigations of the U.S. Geological Survey in Montana, October 1977 Through September 1978.
W79-01379 7C

HYDROPONICS
Nutrient Recovery from Farm Ponds: Hydroponic Plant Production and Other Means, a Review,
W79-01477 5C

ICE
Approximate Calculation of Nonstationary Temperature Regime of a Rock-Ice Dam.
W79-01049 8D

IDAHO
Flood Plain Inundation Caused by Dam Failure,
W79-01265 8B

A Simulation of the Hydraulic Events During and Following the Teton Dam Failure,
W79-01269 8B

The Development and Testing of a Dam-Break Flood Forecasting Model,
W79-01270 8B

Calculating and Routing the Teton Dam-Break Flood,
W79-01271 8B

Analysis of Water Flow Problems in the Hells Canyon of the Snake River,
W79-01359 4A

Water Resources of the Upper Henrys Fork Basin in Eastern Idaho.
W79-01364 6D

ILLINOIS
State Approach to Groundwater Quality Protection: The Illinois Experience,
W79-01156 5G

Water Resources and Other Related Laws of Illinois.
W79-01168 6E

Nutrient Fluxes in Precipitation, Throughfall, and Stemflow in an Oak-Hickory Forest,
W79-01246 2I

INCINERATION
Characteristics of Incinerator Residue and the Effect of its Leachate on Groundwater Quality,
W79-01090 5B

INCINERATOR RESIDUE
Characteristics of Incinerator Residue and the Effect of its Leachate on Groundwater Quality,
W79-01090 5B

INDIA
Pollution Studies of River Khan (Indore) India -- I. Biological Assessment of Pollution,
W79-01018 5A

Geochemical Implications of Summer Monsonnal Rainwater Composition Over India,
W79-01039 2K

Estimation of Water Balance of Lower Sutlej Catchment Up to Bhakra Dam Site by Thornthwaite's Method,
W79-01257 4A

INDIAN RESERVATION
Indians and the Environment: An Examination of Jurisdictional Issues Relative to Environmental Management,
W79-01143 6E

INDIANA
Pre-Management Assessment of Aquatic Macroinvertebrates in a Small, Sedimentary Drainage Area of the Maumee and Lake Erie Basin.
W79-01096 5C

Geomorphologic Characteristics of Fourteen Indiana Watersheds Obtained from a Computer Data Bank of Stream Networks,
W79-01426 4D

INDICATORS
A Water Pollution Survey, Mainly by British School Children,
W79-01354 5G

INDUSTRIAL POLLUTION
Removal of Soluble BOD sub 5 Primary Clarifiers,
W79-01317 5D

INDUSTRIAL PRODUCTION
Market Input/Output Studies. Task I. Vinylidene Chloride,
W79-01500 6B

INDUSTRIAL WASTE
Implementing 'Best Management Practices' for Residuals: The Waste Exchange,
W79-01309 5G

Renovation of Industrial Inorganic Wastewater by Evaporation with Interface Enhancement,
W79-01319 5D

INDUSTRIAL WASTES
Addition of Potato Protein Recovered from Potato Starch Factory Waste Effluents for Bread,
W79-01073 5E

Water Content Reduction of Metal-Plating Waste Sludge by a Press and Centrifuge (Mekki suraji no kokaiteki dassui ni kansuru kisoteki kenkyu),
W79-01082 5E

Impact of the Schwartzwalder Mine on the Water Quality of Ralston Creek, Ralston Reservoir, and Upper Long Lake.
W79-01207 5B

Waste Source Investigations, Kingsport, Tennessee.
W79-01208 5B

Evaluation of the Impact of the Mines Development, Incorporated Mill on Water Quality Conditions in the Cheyenne River.
W79-01209 5B

An Assessment of Technology for Possible Utilization of Bayer Process Muds,
W79-01315 5D

State-of-the-Art: Military Explosives and Propellants Production Industry, Vol. III -- Wastewater Treatment,
W79-01318 5D

Treatment of Electroplating Wastes by Reverse Osmosis,
W79-01320 5D

Treatment and Disposal of Complex Industrial Wastes,
W79-01321 5D

Process for the Purification of Industrial Effluents,
W79-01396 5D

Method of Purification of Waste Water by Treatment with Zirconium Salt,
W79-01397 5D

Cationic Chlorine-Resistant Polymeric Flocculants and Their Use,
W79-01406 5D

Methods and Compositions for Dispersing Oil Films,
W79-01407 5G

Apparatus for Removing Mercury from Waste Water,
W79-01408 5D

Treating Paint Waste Solids,
W79-01416 5D

A Survey of the Freshwater Mussels (Bivalvia: Unionidae) of the Kanawha River of West Virginia,
W79-01435 5C

INDUSTRIAL WATER
Purification of Water for Boiler,
W79-01405 5F

INDUSTRIES
The Industry's Role in Energy Management,
W79-01484 6B

INFRARED RADIATION
Microwave Remote Sensing of Sea Ice in the Aidjex Main Experiment,
W79-01386 2C

INHIBITION
Effect of Copper and Tri- and Hexavalent Chromium on the Work of an Activated Sludge,
W79-01079 5D

INHIBITORS
In Vitro Changes in the Activity of ATPases in the Gills of Carcinus Maenas Exposed to Various Concentrations of p,p'-DDT,
W79-01032 5C

INJECTION
Direct Injection of Reclaimed Water into an Aquifer,
W79-01108 5D

Underground Injection Program Set Under Safe Drinking Water Act,
W79-01154 5G

INLAND WATERWAYS
Computerized Costing Model for Inland Waterways Barge Transportation,
W79-01493 6A

INLAND WETLAND DEFINITIONS
Inland Wetland Definitions,
W79-01335 6E

INORGANIC TRACE ANALYSIS
Ion Exchange Membrane Methods for Continuous Removal of Ions from Water and Trace Chemical Analysis,
W79-01327 5A

INPUT-OUTPUT ANALYSES
A Chemical Budget of a Soft-Water Bog Lake: Benthic Contributions,
W79-01423 2H

INPUT-OUTPUT ANALYSIS
Effects of Selected Changes in the Institutional and Human Environment Upon Output Per Unit of Input,
W79-01491 6B

A Note on the Use of Taxes to Control Pollution,
W79-01496 5G

Market Input/Output Studies. Task I. Vinylidene Chloride,
W79-01500 6B

INSECTICIDES
Effects of Kelthane and Temperature on the Respiration of Crangon Franciscorum,
W79-01241 5C

INSPECTION
First Inspections Highlight US Dams Threat.
W79-01048 8G

INSTITUTIONAL CONSTRAINTS
Legal and Institutional Planning for Macro-Conservation Measures,
W79-01227 6E

Legitimacy of Western Identity in an Economic Balance Water - Land - Energy - People,
W79-01481 6B

Coal Development and Reclamation - Planning and Conservation,
W79-01489 6B

Critique and Challenges,
W79-01490 6B

INSTITUTIONS
Water Quality: Problems and Research Needs,
W79-01348 6B

INSTRUMENTATION
An Automated Procedure for the Simultaneous Determination of Specific Conductance and pH in Natural Water Samples,
W79-01374 2K

INSURANCE
Proposed (Guideline Model) Coastal and Riverine Flood Plain Zoning Ordinance,
W79-01147 6F

INTERTIDAL AREAS
Uptake and Release of Petroleum by Intertidal Sediments at Port Valdez, Alaska,
W79-01022 5B

INVERTEBRATES
Biodeposition by Salt-Marsh Invertebrates,
W79-01288 5B

Group 'B' Vitamins in Peat Soils and Excrement of Invertebrates,
W79-01302 2G

Role of Excrement of Invertebrates in the Activation of Microflora of Marsh Peat Soils,
W79-01303 2G

The Effect of Several Physical and Chemical Factors Upon the Distribution of Benthic Macroinvertebrates in Dunham Pond, Connecticut,
W79-01330 5C

A Water Pollution Survey, Mainly by British School Children,
W79-01354 5G

ION EXCHANGE
Extraction of Ammonium Ions from Wastewaters Generated in the Production of Compound Fertilizers and Their Utilization by Ion-Exchange Method (Izvlechenie ionov ammoniya iz stochnykh vod proizvodsty slozhnykh

udobrenii ikh utilizatsiya metodom ionnogo obmena),
W79-01068 5D

Cation-Exchange Column Behavior in a Desalination Process with Regenerant Recovery,
W79-01280 3A

Cyclic Performance of Layered Beds for Binary Ion Exchange,
W79-01339 3A

Mixed-Bed Ion Exchange Desalting by the Calcium Hydroxide Process,
W79-01340 3A

Water Purification Process,
W79-01404 5D

Method for Removing of Multivalent Heavy Metals from Metal Plating Waste Effluents,
W79-01415 5D

ION SELECTIVE MEMBRANES

Donnan Dialysis Enrichment of Cations,
W79-01011 2K

Ion Exchange Membrane Methods for Continuous Removal of Ions from Water and Trace Chemical Analysis,
W79-01327 5A

IOWA

Little River, Iowa, Watershed Project.
W79-01175 6E

Meeker v. City of Clinton (Flood Damages Caused by Municipal and Railroad Negligence),
W79-01181 6E

Oak Leaf Country Club, Inc. v. Wilson (Flood Damage Caused by Channelization),
W79-01182 6E

Quantification of Recreational Use of the Coralville Reservoir,
W79-01361 6B

IOWA RIVER

Coralville Water Quality Study Annual Report, Water Year October 1, 1975 to September 30, 1976,
W79-01473 5B

IRON

Distribution of Trace Metals and Sediments in Estuaries of the Kum River and the Mankyung River,
W79-01014 5B

The Influence of Colloidal Organic Matter on Iron and Iron-Phosphorus Cycling in an Acid Bog Lake,
W79-01219 5C

Electrochemical Behavior of Rotating Iron Disks Effect of FE(111),
W79-01281 8G

Effects of Chelated Iron on the Growth of Two Species of Vallisneria,
W79-01446 5C

IRON AND STEEL INDUSTRY

Analysis of Economic Effect of Environmental Regulations on Integrated Iron and Steel Industry. Volume II,
W79-01194 5G

IRON COMPOUNDS

Impact of Mine Drainage on a Mountain Stream in Pennsylvania,
W79-01017 5C

IRON-NICKEL ALLOYS

Hydrogen Evolution and Corrosion Behavior of Fe-Ni Alloys in H2SO4 - Effect of Temperature, Cl- and Benzatriazole,
W79-01235 8G

IRRADIATION

Photo-Decomposition of Aqueous Solutions of Phenol (Fenooru suiyoeki no hikari bunkai),
W79-01069 5D

Chronic Exposure of Chinook Salmon Eggs and Alevins to Gamma Irradiation: Effects on Their Return to Freshwater as Adults,
W79-01455 5C

IRRIGATION

Water Quality and Control of Plant Pathogens in Irrigation Reuse,
W79-01358 5D

Water Conduit,
W79-01390 3F

Guidance Control System for Self-Propelled Mobile Sprinkler Irrigation Systems,
W79-01410 3F

Adjustable Height Sprinkler,
W79-01411 3F

IRRIGATION EFFICIENCY

Water Conduit,
W79-01390 3F

IRRIGATION PRACTICES

A Nonstructural Approach to Control Salt Accumulation in Ground Water,
W79-01132 5B

Water Conduit,
W79-01390 3F

IRRIGATION SYSTEMS

Nitrogen and Irrigation Management to Reduce Return-Flow Pollution in the Columbia Basin,
W79-01001 5G

Guidance Control System for Self-Propelled Mobile Sprinkler Irrigation Systems,
W79-01410 3F

IRRIGATION TIMING

Irrigating Corn and Grain Sorghum with Limited Water,
W79-01425 3F

IRVINE (CALIF)

Heat and Thrust Requirements of a Thermal Fog Dispersal System,
W79-01058 3B

ITERATION

The 'Standards and Price' Approach to Pollution Control: Problems of Iteration,
W79-01497 5G

JAPAN

Effect of Acid Mine Drainage on the pH of Lake Toya, Japan,
W79-01258 5B

JELLY FISH

Effect of Dibasol and Vitamin B12 on the Larvae of Aurelia Aurita (Soyphoza) in a Reduced Saline Medium,
W79-01451 5C

JUDICIAL DECISIONS

The Ordinary High Water Mark: Attempts at Settling an Unsettled Boundary Line,
W79-01009 6E

Federal Common Law and Ocean Pollution: A Private Remedy for Oil Pollution Damage,
W79-01150 5G

A Comparison of Bethlehem Steel Corp V. Train with Republic Steel Corp. V. Train: The Sixth Circuit,
W79-01162 5G

JURISDICTION

Indians and the Environment: An Examination of Jurisdictional Issues Relative to Environmental Management,
W79-01143 6E

KELTHANE

Effects of Kelthane and Temperature on the Respiration of Crangon Franciscorum,
W79-01241 5C

KOHL SPRING (MO)

Kohl Spring - Biogeochemistry of a Blackwater System,
W79-01421 5B

KOREA

Distribution of Trace Metals and Sediments in Estuaries of the Kum River and the Mankyung River,
W79-01014 5B

KUM RIVER (KOR)

Distribution of Trace Metals and Sediments in Estuaries of the Kum River and the Mankyung River,
W79-01014 5B

LABORATORY TESTS

Reaeration Performance of Stepped Cascades,
W79-01249 5G

LAKE BIWA (JAPAN)

A Dynamic Water Quality Model of Lake Biwa - A Simulation Study of the Lake Eutrophication,
W79-01475 5C

LAKE KINNERET (ISRAEL)

Quantitative and Qualitative Changes in the Phytoplankton of Lake Kinneret, Israel, 1972-1975,
W79-01198 5C

LAKE MICHIGAN

Role of Turbulent Mixing in the Dispersion of Pollutants at the Edge of a Large Lake,
W79-01199 5C

LAKE ONTARIO

Wind Effects on Surface to Bottom Fronts,
W79-01045 2L

LAKE PAIJANNE (FINLAND)

Total Mercury and Methyl Mercury Contents in Fish from Lake Paijanne,
W79-01028 5C

LAKE SANGCHRIS (ILLINOIS)

Waterfowl Collisions with Power Lines at a Coal-Fired Power Plant,
W79-01434 6G

LAKE SEDIMENTS

Accumulation of Arsenic in Sediments of Lakes Treated with Sodium Arsenite,
W79-01253 5B

A Chemical Budget of a Soft-Water Bog Lake: Benthic Contributions,
W79-01423 2H

LAKE SUPERIOR

Organic Contaminants,
W79-01471 5C

LAKE TOYA (JAPAN)

Effect of Acid Mine Drainage on the pH of Lake Toya, Japan,
W79-01258 5B

LAKE WINDERMERE
Dissolved Mercury in the Lake Windermere Catchment Area,
W79-01040 5B

LAKES
Wind Effects on Surface to Bottom Fronts,
W79-01045 2L

Primary Production in a Shallow Water Lake with Special Reference to a Reed Swamp,
W79-01223 5C

Accumulation of Arsenic in Sediments of Lakes Treated with Sodium Arsenite,
W79-01253 5B

The Effect of Several Physical and Chemical Factors Upon the Distribution of Benthic Macroinvertebrates in Dunham Pond, Connecticut,
W79-01330 5C

A Chemical Budget of a Soft-Water Bog Lake: Benthic Contributions,
W79-01423 2H

A Preliminary Survey of the Zooplankton and Benthos of an Arctic Lake Near Prudhoe Bay, Alaska,
W79-01427 2H

The Slope of Gran's Plot: A Useful Function in the Examination of Precipitation, the Water-Soluble Part of Airborne Particles, and Lake Water,
W79-01474 5A

LAND
Fragile Lands and People,
W79-01487 6B

LAND CLASSIFICATION
Inclusion of Alaska Lands in National Park, Forest, Wildlife Refuge, and Wild Scenic Rivers Systems (Part XIII, Alaska Town Meetings),
W79-01180 6E

LAND CLEARING
The Impact of Logging on Salmonid Resources in the Pacific Northwest,
W79-01466 4C

LAND DISPOSAL OF SLUDGE
Economic Analysis of Alternative Sludge Disposal Methods in Vermont,
W79-01328 5E

LAND RECLAMATION
Feasibility Study, Fly Ash Reclamation of Surface Mines, Hillman State Park, Feasibility Study,
W79-01323 5G

LAND RESOURCES
City of Berkely V. Superior Court for the County of Alameda (Additional Adjudication Issues Need to Determine if Land Subject to Public 'Tideland Trust'),
W79-01189 6E

LAND SUBSIDENCE
Land Subsidence in the Santa Clara Valley,
W79-01365 2F

LAND TENURE
Philadelphia Chewing Gum Co. V. Commonwealth of Pennsylvania, Dept. of Environmental Resources (Land-Owners and Occupiers Liable for Correction of Polluting Condition).
W79-01191 6E

LAND TREATMENT
Proceedings of a Symposium on Land Treatment of Waste Effluents Center of Adult Education, University of Maryland, April 25-26, 1978.
W79-01329 5D

LAND USE
The Effects of Land Use on Phosphorus Loading: A Case Study - Six Mile Run Reservoir,
W79-01086 5C

Vested Rights to Develop Land: California's AVCO Decision and Legislative Responses,
W79-01148 6F

Inland Wetland Definitions,
W79-01335 6E

Fragile Lands and People,
W79-01487 6B

An Economic Evaluation of Cropland Use as a Control for Sediment Nonpoint Pollution,
W79-01498 5G

LAND USE REGULATION
Inland Wetland Definitions,
W79-01335 6E

LARVAE
Uptake of Zinc by the Aquatic Larvae of Simulium Ornatipes (Diptera: Newatocera),
W79-01026 5C

Interrelation Between Insect Larvae and Soil Microflora in Forest Bogs,
W79-01301 2G

Role of Excrement of Invertebrates in the Activation of Microflora of Marsh Peat Soils,
W79-01303 2G

LAW OF THE SEA
A Constitution for the Oceans: Comments and Suggestions Regarding Part XI of the Informal Composite Negotiating Text,
W79-01149 6E

Seabed Resources and International Law,
W79-01158 6E

Status Report on Law of the Sea Conference.
W79-01176 6E

LAYERED BEDS
Cyclic Performance of Layered Beds for Binary Ion Exchange,
W79-01339 3A

LEACHATE
Characteristics of Incinerator Residue and the Effect of its Leachate on Groundwater Quality,
W79-01090 5B

LEACHING
Field Permeability Methods for In-Place Leaching,
W79-01111 2F

LEAST SQUARES METHOD
Reconciliation of Apparent Nonequivalence Among Alternative Rating Methods,
W79-01240 6B

LEGAL ASPECTS
The Ordinary High Water Mark: Attempts at Settling an Unsettled Boundary Line,
W79-01009 6E

Vested Rights to Develop Land: California's AVCO Decision and Legislative Responses,
W79-01148 6F

Legal and Institutional Planning for Macro-Conservation Measures,
W79-01227 6E

Inland Wetland Definitions,
W79-01335 6E

LEGAL DEFINITION
Inland Wetland Definitions,
W79-01335 6E

LEGISLATION
The Ordinary High Water Mark: Attempts at Settling an Unsettled Boundary Line,
W79-01009 6E

Water Resources and Other Related Laws of Illinois.
W79-01168 6E

Federal Water Pollution Control Act Amendments of 1977 (Appendix, Statements Submitted for the Record).
W79-01172 6E

Oil Pollution Liability.
W79-01173 6E

Inclusion of Alaska Lands in National Park, Forest, Wildlife Refuge, and Wild and Scenic Rivers Systems (Part II, Washington, D.C.).
W79-01177 6E

Inclusion of Alaska Lands in Natl. Park, Forest, Wildlife Refuge, and Wild and Scenic Rivers Systems (Part V, Atlanta, GA.).
W79-01178 6E

Inclusion of Alaska Lands in National Park, Forest, Wildlife Refuge, and Wild Scenic Rivers Systems (Part XIII, Alaska Town Meetings),
W79-01180 6E

State Waters-General Provisions.
W79-01183 6E

Equitable Recovery of Industrial Waste Treatment Costs in Municipal Systems, Federal Guidelines.
W79-01206 5D

Inland Wetland Definitions,
W79-01335 6E

LIGANDS
Effect of Complexation by Natural Organic Ligands on the Toxicity of Copper to a Unicellular Alga, Monochrysis Lutheri,
W79-01449 5C

LIGHT
The Effect of Dirunal Variation in Light and Temperature on the Acetylene Reduction Activity (N2 Fixation) of Subterranean Clover,
W79-01092 2I

LIGNINS
Laboratory Investigation of Water Pollution by Organic Substances in Flax Wastes Delignification (Laboratorne sledovanie organickeho znecistenia vod pri delignifikacii lanovych odpadov),
W79-01085 5B

LIME
Investigations of the Decoloration of Wastewaters Generated in Confier Sulfate Pulp Mills (Cercetari privind decolorarea apelor reziduale provenite de la fabricarea celulozei sulfat din rasinoase),
W79-01084 5D

LIME-ALGAE SLUDGE
The Dewatering of Lime-Algae Sludge on Sand Drying Beds,
W79-01349 5D

LIMITED IRRIGATION
Irrigating Corn and Grain Sorghum with Limited Water,
W79-01425 3F

LIMITING FACTORS
Observations on Algal Populations and Experimental Maturation Pond System.
W79-01196 5D

LIMNOLOGY
Limnological Characteristics of the Potomac Estury,
W79-01195 5C

LIQUID WASTES
Differential Bed Kinetic Analysis of Heavy Metal Removals by Biological Slimes,
W79-01314 5D

LITTLE TENNESSEE RIVER VALLEY (TN)
The Tennessee Valley Authority's Tellico Dam Project-Costs, Alternatives, and Benefits.
W79-01193 6B

LITTLE WITHLACOOCHEE RIVER (FLA)
Hydrogeologic Maps of a Flood Detention Area Proposed by Southwest Florida Water Management District Green Swamp Area, Florida,
W79-01383 7C

LIVING FILTER SYSTEM
Wastewater Recycling on Forest Lands,
W79-01424 5D

LOCAL GOVERNMENTS
Proposed (Guideline Model) Coastal and Riverine Flood Plain Zoning Ordinance,
W79-01147 6F

LOGGING
The Impact of Logging on Salmonid Resources in the Pacific Northwest,
W79-01466 4C

LOGGING PRACTICES
The Impact of Logging on Salmonid Resources in the Pacific Northwest,
W79-01466 4C

LOGGING (RECORDING)
Remote Sensing of Water Levels in Small-Diameter Wells,
W79-01101 7B

LONG-TERM PLANNING
Policy Implications of Urban Land Practices for Groundwater Quality,
W79-01146 5G

LOTIC ENVIRONMENT
Dissolved Organic Carbon Fluxes in the Shetucket River of Eastern Connecticut, USA,
W79-01337 5C

LOUISIANA
An Ecological Study of a Baldcypress Swamp in St. Charles Parish, Louisiana,
W79-01226 2L

Effect of Failure of the Old River Control Structure on Municipal and Industrial Water Supplies,
W79-01336 4A

LOW FLOW
Low-Flow Characteristics of Streams in the Rock-Fox River Basin, Wisconsin,
W79-01366 2E

LUMBRICULUS
Importance of Algae in the Diet of the Oligochetes Lumbriculus Variegatus (Muller) and Rhyacodrilus Sodalis (Eisten),
W79-01453 5C

MACOMA
The Availability of Sediment-Bound Cobalt, Silver, and Zinc to a Deposit-Feeding Clam,
W79-01468 5B

MACROINVERTEBRATES
The Effect of Several Physical and Chemical Factors Upon the Distribution of Benthic Macroinvertebrates in Dunham Pond, Connecticut,
W79-01330 5C

MALLARD DUCKS
Habitat Use and Home Range of Mallards Breeding in Minnesota,
W79-01287 2I

MAMMALS
Characteristics of Small Mammal Populations in Forested and Old Field Habitats Prior to Effluent Spray Irrigation,
W79-01331 5C

MANAGEMENT
Coastal Planning: The Designation and Management of Areas of Critical Environmental Concern,
W79-01152 5G

Water Quality: Problems and Research Needs,
W79-01348 6B

Coordinated Energy Management,
W79-01479 6B

The Industry's Role in Energy Management,
W79-01484 6B

MANCOS SHALE
Salt Pickup by Overland Flow in the Price River Basin, Utah,
W79-01245 5B

MANGANESE
Distribution of Trace Metals and Sediments in Estuaries of the Kum River and the Mankyung River,
W79-01014 5B

MANGROVE SWAMPS
Inland Mangroves and Water Chemistry, Barbuda, West Indies,
W79-01215 2K

MANKYUNG RIVER (KOR)
Distribution of Trace Metals and Sediments in Estuaries of the Kum River and the Mankyung River,
W79-01014 5B

MAPS
Probable Yields of Wells in the Niagara Aquifer, Wisconsin,
W79-01367 7C

Dissolved-Solids Concentrations of Water in the Niagara Aquifer, Wisconsin,
W79-01369 7C

Program for Monitoring Surface-Water Quality in Florida,
W79-01376 7C

Hydrogeologic Maps of a Flood Detention Area Proposed by Southwest Florida Water Management District Green Swamp Area, Florida,
W79-01383 7C

MARINE ALGAE
Mortalities of Pen-Reared Salmon Associated with Blooms of Marine Algae,
W79-01462 5C

MARINE BACTERIA
Biological Control Agents of Sewage Bacteria in Marine Habitats,
W79-01027 5C

MARINE BIOLOGY
Trace Metal Enhancement in the Biotic and Abiotic Components of an Estuarine Tidal Front,
W79-01046 5B

MARINE FISH
Abundance, Diversity, and Stability in Shore-Zone Fish Communities in an Area of Long Island Sound Affected by the Thermal Discharge of a Nuclear Power Station,
W79-01021 5C

MARINE INSECTS
Chlorinated Hydrocarbons in Marine Insects,
W79-01023 5B

MARSH PLANTS
The Ecotone Between Spartina Foliosa Trin. and Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay: II. Soil Water and Salinity,
W79-01218 2L

The Ecotone Between Spartina Foliosa Trin. and Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay: III. Soil Aeration and Tidal Immersion,
W79-01283 2L

Growth and Resource Allocation Responses of Spartina Alterniflora Loisel to Three Levels of NH sub 4-N, FE, and NACL in Solution Culture,
W79-01294 2I

The Shift of Bog Vegetation Under the Influence of Drying,
W79-01304 2H

Standing Crops of Marsh Vegetation of Two Tributaries of Chesapeake Bay,
W79-01433 2L

MARSHES
Micro-Inhabitants of Marsh Peat Soils in the Tomsk Region,
W79-01299 2H

MASS TRANSFER
The Role of Membrane Methods in the Desalination of Brackish Water,
W79-01343 3A

MATHEMATICAL MODELS
The Dam-Break Wave and the Bore Collapse on a Beach,
W79-01263 8B

Unsteady Flow Analysis of Dam-Break Waves,
W79-01264 8B

Unsteady Flow Modeling of Dam-Break Waves,
W79-01268 8B

The Development and Testing of a Dam-Break Flood Forecasting Model,
W79-01270 8B

Calculating and Routing the Teton Dam-Break Flood,
W79-01271 8B

Dam-Break Flood Wave Computation by Method of Characteristics and Linearized Implicit Schemes,
W79-01274 8B

A Numerical Model for Multidimensional Unconstrained Flow Over Irregular Terrain,
W79-01275 8B

Dam Break Flood Wave Analysis: Problems, Pitfalls, and Partial Solutions,
W79-01276 8B

Criteria for Routing the Dam-Break Flood,
W79-01278 8B

Sensitivity Analysis of a Phosphorus Removal Strategy Computer Model,
W79-01310 5D

Parameter Identification in an Inhomogeneous Medium with Finite Element Method,
W79-01341 2F

A Dynamic Water Quality Model of Lake Biwa - A Simulation Study of the Lake Eutrophication,
W79-01475 5C

The Response of Firms to Pollution Charges,
W79-01499 5G

MATHEMATICAL STUDIES
Time Averaged Areal Mean of Precipitation: Estimation and Network Design,
W79-01357 2B

Lag Adjustment Between Estimated and Actual Physiological Responses Conducted in Flow-Through Systems,
W79-01445 5C

MATURATION PONDS
Observations on Algal Populations and Experimental Maturation Pond System,
W79-01196 5D

MEADOW VOLE
Characteristics of Small Mammal Populations in Forested and Old Field Habitats Prior to Effluent Spray Irrigation,
W79-01331 5C

MEANDERS
Bed Forms and Stratification Types of Modern Gravel Meander Lobes, Nueces River, Texas,
W79-01044 2J

MECHANICALLY GENERATED WAVES
Drift Velocity of Surface Films Over Waves,
W79-01139 5B

MEMBRANE PROCESSES
Treatment of Wastewaters Generated in Electroplating Shops by Reverse Osmosis. (1. Concentration of Washing Waters from Nickel-Plating Processes) (Ochistka stokov gal'vanotekhov metodom obratnogo osmosa (1. kontsentrirovanie promyvnkh vod nikelirovaniya),
W79-01077 5D

Treatment of Electroplating Wastes by Reverse Osmosis,
W79-01320 5D

The Role of Membrane Methods in the Desalination of Brackish Water,
W79-01343 3A

MEMBRANES
Specification of Cellulose Acetate to be Used in Semipermeable Membranes,
W79-01129 3A

MENIDIA
Effect of Thermal Shock on Predator Avoidance by Larvae of Two Fish Species,
W79-01454 5C

MERCURY
Bioassays on Marine Organisms: Acute Toxicity Test of Mercury, Cadmium, and Copper to Arkshell, Anadara Broughtonii, from Jin-Dong Bay, and to Oyster, Crassostrea Gigas, from Kwangdo Bay, South Coast of Korea,
W79-01015 5C

Effect of Mercuric Chloride on the Digestive System of a Teleost Fish, Channa Punctatus,
W79-01019 5C

Total Mercury and Methyl Mercury Contents in Fish from Lake Paijanne,
W79-01028 5C

Chlorinated Hydrocarbons and Mercury in Aquatic Vascular Plants of Lake Paijanne, Finland,
W79-01029 5C

Dissolved Mercury in the Lake Windermere Catchment Area,
W79-01040 5B

Geochemistry of Mercury in Palos Verdes Sediments,
W79-01250 5B

MERCURY RECOVERY
Apparatus for Removing Mercury from Waste Water,
W79-01408 5D

METABOLISM
Metabolism of Polychlorinated Biphenyls by Marine Bacteria,
W79-01443 5C

METAL DEPOSITION KINETICS
Removal of Metallic Impurities from Water by Electrochemical Methods,
W79-01121 5D

METAL PLATING WASTES
Method for Removing of Multivalent Heavy Metals from Metal Plating Waste Effluents,
W79-01415 5D

METALLURGY
Treatment of Electroplating Wastes by Reverse Osmosis,
W79-01320 5D

METALS
Trace Metal Enhancement in the Biotic and Abiotic Components of an Estuarine Tidal Front,
W79-01046 5B

Application of Packed Biopolar Cell to Electrolytic Treatment of Waste Waters, (In Japanese),
W79-01080 5D

METHANE
On the Mechanisms of CO2 and CH4 Production in Natural Anaerobic Environments,
W79-01135 5C

METHODOLOGY
Gas-Driven Pump for Ground-Water Supplies,
W79-01378 8C

Applying a Chemical Modelling Technique to Ecological Problems,
W79-01444 5B

MICROBIAL DEGRADATION
Metabolism of Polychlorinated Biphenyls by Marine Bacteria,
W79-01443 5C

MICROBIAL METABOLISM
Sedimentation and Microbial Metabolism in a Shallow Estuary,
W79-01091 2J

MICROORGANISMS
Interrelation Between Insect Larvae and Soil Microflora in Forest Bogs,
W79-01301 2G

MICROWAVES
Microwave Remote Sensing of Sea Ice in the Aidjex Main Experiment,
W79-01386 2C

MILFOIL
Changes in Submerged Aquatic Macrophyte Populations at the Head of Chesapeake Bay, 1958-1975,
W79-01030 5C

MILLSTONE POINT (CONN)
Abundance, Diversity, and Stability in Shore-Zone Fish Communities in an Area of Long Island Sound Affected by the Thermal Discharge of a Nuclear Power Station,
W79-01021 5C

MINE DRAINAGE
Mine Effluents in the Front Range Mineral Belt of Colorado,
W79-01008 5B

Impact of Mine Drainage on a Mountain Stream in Pennsylvania,
W79-01017 5C

Effect of Acid Mine Drainage on the pH of Lake Toya, Japan,
W79-01258 5B

Geochemistry of Mine Effluents in the Front Range Mineral Belt of Colorado,
W79-01363 5A

MINE EFFLUENTS
Mine Effluents in the Front Range Mineral Belt of Colorado,
W79-01008 5B

MINE WASTES
Impact of the Schwartzwalder Mine on the Water Quality of Ralston Creek, Ralston Reservoir, and Upper Long Lake.
W79-01207 5B

Evaluation of the Impact of the Mines Development, Incorporated Mill on Water Quality Conditions in the Cheyenne River.
W79-01209 5B

Geochemistry of Mine Effluents in the Front Range Mineral Belt of Colorado,
W79-01363 5A

MINING
Metallic Mining Reclamation Act,
W79-01188 6E

MINING ENGINEERING
Field Permeability Methods for In-Place Leaching,
W79-01111 2F

MINNESOTA
Habitat Use and Home Range of Mallards Breeding in Minnesota,
W79-01287 2I

MIRES
Relationships Between Mineral Supply and Growth of Narthecium Ossifragum (L.) Huds. on Mire Ecosystems,
W79-01216 2H

MISSISSIPPI
Warrior, Inc. V. Easterly (Developer Assessed Damages Caused by Excess Drainage Water and Debris Polluting Landowner's Pond,
W79-01192 6E

MISSISSIPPI RIVER
Field Study of Sediment Transport Characteristics of the Mississippi River near Fox Island (RM 355-6) and Buzzard Island (RM 349-50),
W79-01065 2J

Effect of Failure of the Old River Control Structure on Municipal and Industrial Water Supplies,
W79-01336 4A

MISSOURI
Kohl Spring - Biogeochemistry of a Blackwater System,
W79-01421 5B

MIXING
Role of Turbulent Mixing in the Dispersion of Pollutants at the Edge of a Large Lake,
W79-01199 5C

MODEL STUDIES
Regional Water Supply Capacity Expansion with Seasonal Demands and Energy Costs,
W79-01002 6A

Modeling Pesticides and Nutrients on Agricultural Lands,
W79-01004 5B

Sand Transport Model of Barchan Dune Equilibrium,
W79-01043 2J

Fish Ladder for Charles River Dam, Charles River, Massachusetts, Hydraulic Model Investigation,
W79-01052 8I

A Probabilistic Analysis of Embankment Stability Problems,
W79-01054 8D

Prediction of Convective Activity Using a System of Parasitic-Nested Numerical Models,
W79-01056 2B

Simulation of Flood Waves in Channels,
W79-01060 2E

Generation of Daily Precipitation Over an Area,
W79-01261 2B

Proceedings of Dam-Break Flood Routing Model Workshop.
W79-01262 8B

A Simulation of the Hydraulic Events During and Following the Teton Dam Failure,
W79-01269 8B

Comparative Analysis of Routing Techniques for the Floodwave from a Ruptured Dam,
W79-01272 8B

Qualitative Comparison of Three Dam Break Routing Models,
W79-01273 8B

Simulation of Dam Break Flooding Under Normal and Probable Maximum Flood Conditions,
W79-01277 8B

Mixed-Bed Ion Exchange Desalting by the Calcium Hydroxide Process,
W79-01340 3A

Optimal Operation of Large Agricultural Watersheds with Water Quality Constraints,
W79-01355 4D

Analysis of Water Flow Problems in the Hells Canyon of the Snake River,
W79-01359 4A

Applying a Chemical Modelling Technique to Ecological Problems,
W79-01444 5B

MOLLUSKS
Bioassays on Marine Organisms: Acute Toxicity Test of Mercury, Cadmium, and Copper to Arkshell, Anadara Broughtonii, from Jin-Dong Bay, and to Oyster, Crassostrea Gigas, from Kwangdo Bay, South Coast of Korea,
W79-01015 5C

MOLTEN SALTS
Electrodissolution of Nickel in Molten LiCl-KCl,
W79-01234 8G

MONITORING
Waste Source Investigations, Kingsport, Tennessee.
W79-01208 5B

The Effect of Some Basic Statistical and Biological Principles on Water Pollution Control,
W79-01243 5G

MONSOD SYSTEM
Review of R & D on Water Hyacinth Utilization in the Philippine Republic,
W79-01470 4A

MONSOONS
Geochemical Implications of Summer Monsonal Rainwater Composition Over India,
W79-01039 2K

MONTANA
Heavy Metal Accumulation and its Effect on the Biota of an Industrial Settling Pond,
W79-01124 5D

Right to Construct Dams and Raise Water-Conducting Water Over Lands and Railroad Rights of Way,
W79-01185 6E

Water-Resources Investigations of the U.S. Geological Survey in Montana, October 1977 Through September 1978.
W79-01379 7C

MORTALITIES
Mortalities of Pen-Reared Salmon Associated with Blooms of Marine Algae,
W79-01462 5C

MORTALITY
The Toxic Effects of the Water Soluble Fractions of No. 2 Fuel Oil and Three Aromatic Hydrocarbons on the Behavior and Survival of Barnacle Larvae,
W79-01025 5C

Growth and Mortality of Littorina Irrorata Say in Three North Carolina Marshes,
W79-01289 2L

Waterfowl Collisions with Power Lines at a Coal-Fired Power Plant,
W79-01434 6G

Acute Effects of Underwater Construction Blasting on Fishes in Long Point Bay, Lake Erie,
W79-01452 5C

MOSQUITOFISH
A Biological Assessment of Fish and Benthic Populations Inhabiting a Kraft Mill Effluent Channel,
W79-01448 5C

MOSS
The Response of Empetrum Nigrum L. to Different Mire Water Regimes, with Special Reference to Wybunbury Moss, Cheshire and Featherbed Moss, Derbyshire,
W79-01293 5C

MUCK SOILS
Group 'B' Vitamins in Peat Soils and Excrement of Invertebrates,
W79-01302 2G

Role of Excrement of Invertebrates in the Activation of Microflora of Marsh Peat Soils,
W79-01303 2G

MUD
An Assessment of Technology for Possible Utilization of Bayer Process Muds,
W79-01315 5D

MULCHING
Effect of Mulching on Sediment in Runoff from Simulated Rainfall,
W79-01130 4D

MULTI-STATE INSTITUTIONS
Legitimacy of Western Identity in an Economic Balance Water - Land - Energy - People,
W79-01481 6B

MULTIPLE-PURPOSE RESERVOIRS
Analysis of Water Flow Problems in the Hells Canyon of the Snake River,
W79-01359 4A

Quantification of Recreational Use of the Coralville Reservoir,
W79-01361 6B

MUNICIPAL SEWAGE SLUDGE INCINERATOR ASH
Characteristics of Incinerator Residue and the Effect of its Leachate on Groundwater Quality,
W79-01090 5B

MUNICIPAL WASTES
How to Obtain Federal Grants to Build Municipal Wastewater Treatment Works.
W79-01210 5G

MUNICIPAL WATER
Bond Street and Weatherbest Slip Boathouse Owners V. City of North Tonawanda (City may not Terminate Water Service to a Customer in Good Standing).
W79-01187 6E

Chemical Quality of Water Used for Municipal Supply in Florida, 1975,
W79-01375 7C

MUSSELS
A Survey of the Freshwater Mussels (Bivalvia: Unionidae) of the Kanawha River of West Virginia,
W79-01435 5C

MUTAGENS
Chlorine effects on Larval Development of Striped Bass (Morone Saxatilis), White Perch (M. Americana) and Blueback Herring (Alosa Aestivalis),
W79-01456 5C

MYCOBACTERIA
The Importance of Water for the Spread of Potentially Pathogenic Mycobacteria: II. Growth of Mycobacteria in Water Models, (In German),
W79-01259 5C

NAPHTHALENE
The Toxic Effects of the Water Soluble Fractions of No. 2 Fuel Oil and Three Aromatic Hydrocarbons on the Behavior and Survival of Barnacle Larvae,
W79-01025 5C

NARRAGANSETT BAY (RI)
Fatty Acid Composition of Organic Detritus from Spartina Alterniflora,
W79-01332 5C

NARTHECIUM OSSIFRAGNUM
Relationships Between Mineral Supply and Growth of Narthecium Ossifragum (L.) Huds. on Mire Ecosystems,
W79-01216 2H

NATIONAL ENERGY PLAN
Regional - Implications - Overview of National Energy Employment Relations,
W79-01483 6B

NATIONAL ENVIRONMENTAL POLICY ACT
Environment, Power, and Impact Assessment: The Politics of Information,
W79-01229 6G

NATIONAL INCOME
Effects of Selected Changes in the Institutional and Human Environment Upon Output Per Unit of Input,
W79-01491 6B

NATIONAL PARKS
Tap Water and Timber - The Costs of Multiple Use,
W79-01166 5G

NATIONAL WATER COMMISSION
National Water Commission Views Groundwater Protection,
W79-01155 5G

NATURAL RESOURCES
Riparian Rights Under the Texas Water Rights Adjudication Act - A Constitution Analysis,
W79-01140 6E

Conference Proceedings - A Critical Economic Balance, Water - Land - Energy - People - Held at Colorado State University, Pingree Park Campus on June 6-7, 1977,
W79-01478 6B

Coordinated Energy Management,
W79-01479 6B

The National Energy Plan,
W79-01480 6B

Legitimacy of Western Identity in an Economic Balance Water - Land - Energy - People,
W79-01481 6B

Water -- Demand and Supply: Economic Impacts,
W79-01482 6B

Regional - Implications - Overview of National Energy Employment Relations,
W79-01483 6B

The Industry's Role in Energy Management,
W79-01484 6B

Population Growth and Socio-Economic Balance: How to Visualize Alternative Futures,
W79-01485 6B

Critique of the Challenges,
W79-01486 6B

Fragile Lands and People,
W79-01487 6B

Viewpoint from the Capital Market,
W79-01488 6B

Coal Development and Reclamation - Planning and Conservation,
W79-01489 6B

Critique and Challenges,
W79-01490 6B

Renewable Resource Management and Extinction,
W79-01495 6A

NAVIGABLE WATERS
The Fox in the Chicken Coop: The Regulatory Program of the U.S. Army Corps of Engineers,
W79-01141 6E

NEBRASKA
The Case of the Shrinking Channels-The North Platte and Platte Rivers in Nebraska,
W79-01380 4A

NEGOTIATIONS
A Constitution for the Oceans: Comments and Suggestions Regarding Part XI of the Informal Composite Negotiating Text,
W79-01149 6E

Should the Law of the Sea Conference Be Saved,
W79-01157 6E

NESTING
Great Blue Herons Respond to Nesting Habitat Loss,
W79-01432 6G

NETWORK DESIGN
Time Averaged Areal Mean of Precipitation: Estimation and Network Design,
W79-01357 2B

NETWORKS
Water-Resources Investigations of the U.S. Geological Survey in Montana, October 1977 Through September 1978.
W79-01379 7C

NEUSE RIVER (NC)
Evaluation of Micromolar Complexiometric Titrations for the Determination of the Complexing Capacity of Natural Waters,
W79-01344 5A

Determination of the Complexing Capacity of Natural Water by Cobalt (III) Complexation,
W79-01345 5A

NEW ENGLAND
Wind Effects on Surface to Bottom Fronts,
W79-01045 2L

NEW HAMPSHIRE
Electron Spin Resonance Analysis of Semiquinone Free Radicals of Aquatic and Soil Fulvic and Humic Acids,
W79-01133 5A

Water Resources Data for New Hampshire and Vermont, Water Year 1977.
W79-01372 7C

NEW JERSEY
Distribution of Autotrophic Nitrifying Bacteria in a Polluted River (the Passaic),
W79-01007 5B

The Effects of Land Use on Phosphorus Loading: A Case Study - Six Mile Run Reservoir,
W79-01086 5C

Organic Compounds in the Delaware River,
W79-01252 5B

NEW MEXICO
An Energy Budget Analysis of Evapotranspiration from Saltcedar,
W79-01231 3B

NEW YORK
Bond Street and Weatherbest Slip Boathouse Owners V. City of North Tonawanda (City may not Terminate Water Service to a Customer in Good Standing).
W79-01187 6E

Digital-Model Simulation of the Glacial-Outwash Aquifer, Otter Creek-Dry Creek Basin, Cortland County, New York,
W79-01377 2F

NIAGARA AQUIFER (WIS)
Probable Yields of Wells in the Niagara Aquifer, Wisconsin,
W79-01367 7C

Dissolved-Solids Concentrations of Water in the Niagara Aquifer, Wisconsin,
W79-01369 7C

NICKEL
Treatment of Wastewaters Generated in Electroplating Shops by Reverse Osmosis. (I. Concentration of Washing Waters from Nickel-Plating Processes) (Ochistka stokov gal'vanotsekhov metodom obratnogo osmosa (1. kontsentrirovanie promyvnkh vod nikelirovaniya),
W79-01077 5D

Electrodissolution of Nickel in Molten LiCl-KCl,
W79-01234 8G

NILE RIVER BASIN
Aquatic Weed Management: Some Prospects for the Sudan and the Nile Basin, Report of a Workshop Held at Khartoum, Sudan on 24-29 November 1975.
W79-01205 5G

NITRATE
Drainage Control to Diminish Nitrate Loss from Agricultural Fields,
W79-01137 5G

Nitrate and Nitrite in the Surface Waters of Two Delaware Salt Marshes,
W79-01291 5B

NITRATES
An Improved Hydrazine Reduction Method for the Automated Determination of Low Nitrate Levels in Freshwater,
W79-01042 5A

Oxidation-Reduction Chemistry And Aqueous Ammonium Oxidation in the Estimation of Nitrate by the Cadmium Reduction Method,
W79-01100 5B

Fertilizing Fish Ponds: I. Chemistry of the Waters,
W79-01286 5C

Field Study of Solute Movement in a Highly Aggregated Oxisol with Intermittent Flooding: I. Nitrate,
W79-01360 3F

NITRIFICATION
Carbon and Nitrogen Transformations in Soils Amended with Sewage Sludge,
W79-01350 5C

NITRIFICATON
Distribution of Autotrophic Nitrifying Bacteria in a Polluted River (the Passaic),
W79-01007 5B

NITRIFYING BACTERIA
Distribution of Autotrophic Nitrifying Bacteria in a Polluted River (the Passaic),
W79-01007 5B

NITRITE
Nitrate and Nitrite in the Surface Waters of Two Delaware Salt Marshes,
W79-01291 5B

NITROGEN
Nitrogen and Irrigation Management to Reduce Return-Flow Pollution in the Columbia Basin,
W79-01001 5G

Nitrogen and Phosphorus Fertilization of Aquatic Vascular Plants and Algae in Replicated Ponds. I. Initial Response to Fertilization,
W79-01224 5C

Response in Production of Cord Grass, Spartina Alterniflora, to Inorganic Nitrogen and Phosphorus Fertilizer,
W79-01225 2L

A Chemical Budget of a Soft-Water Bog Lake: Benthic Contributions,
W79-01423 2H

NITROGEN FIXATION
Nitrogen Accretion, and the Nature and Possible Significance of N2 Fixation (Acetylene Reduc-

tion) in a Nova Scotian Spartina Alterniflora Stand,
W79-01214 5C

NITROGEN TRANSFORMATION
Carbon and Nitrogen Transformations in Soils Amended with Sewage Sludge,
W79-01350 5C

NITROSAMINES
Recovery of Nitrosamines from Water,
W79-01006 5D

NON-GAME BIRDS
Stream Channelization Impacts on Songbirds and Small Mammals in Vermont,
W79-01431 6G

NON-RENEWABLE RESOURCES
Resource Extraction and Recycling with Environmental Costs,
W79-01492 6A

NONAUTONOMOUS MODELS
Renewable Resource Management and Extinction,
W79-01495 6A

NONPOINT SOURCE LOADING FUNCTION
Salt Pickup by Overland Flow in the Price River Basin, Utah,
W79-01245 5B

NORTH CAROLINA
Drainage Control to Diminish Nitrate Loss from Agricultural Fields,
W79-01137 5G

Man's Impact on the Barrier Islands of North Carolina,
W79-01220 6G

Growth and Mortality of Littorina Irrorata Say in Three North Carolina Marshes,
W79-01289 2L

Phosphorus Cycling in Nuphar luteum Communities in the Lower Chowan River, North Carolina,
W79-01326 5C

Evaluation of Micromolar Complexiметric Titrations for the Determination of the Complexing Capacity of Natural Waters,
W79-01344 5A

Determination of the Complexing Capacity of Natural Water by Cobalt (III) Complexation,
W79-01345 5A

Seasonal Growth and Decomposition of Vallisneria americana in the Pamlico River Estuary,
W79-01362 5C

Hydrologic Impact of Land Drainage on Estuaries,
W79-01385 4A

NORTH DAKOTA
Impact of Floods and Alternative Flood Control Measures on the Devils Lake Basin Economy,
W79-01122 6B

Non-Resident Hunters--Benefactors or Bad Men.
W79-01138 6B

State Waters-General Provisions.
W79-01183 6E

NORTH PLATTE RIVER (NEB)
The Case of the Shrinking Channels-The North Platte and Platte Rivers in Nebraska,
W79-01380 4A

NORTHEAST FLORIDA
Water Resources Data for Florida, Water Year 1977--Volume 1: Northeast Florida.
W79-01373 7C

NUECES RIVER (TEXAS)
Bed Forms and Stratification Types of Modern Gravel Meander Lobes, Nueces River, Texas,
W79-01044 2J

NUMERICAL ANALYSIS
A Numerical Model for Multidimensional Unconstrained Flow Over Irregular Terrain,
W79-01275 8B

NUTRIENT CYCLES
Monthly Determinations of the Concentrations of Sodium, Potassium, Magnesium and Calcium in the Rain and Pools of the Silver Flowe National Nature Reserve.
W79-01212 2K

NUTRIENT CYCLING
The Okefenokee Swamp Watershed: Water Balance and Nutrient Budgets,
W79-01211 2H

NUTRIENT LOADING MODELS
The Effects of Land Use on Phosphorus Loading: A Case Study - Six Mile Run Reservoir,
W79-01086 5C

NUTRIENT REMOVAL
Addition of Potato Protein Recovered from Potato Starch Factory Waste Effluents for Bread,
W79-01073 5E

Observations on Algal Populations and Experimental Maturation Pond System,
W79-01196 5D

Fresh-Water Weeds are a Resource,
W79-01197 5C

Nutrient Recovery from Farm Ponds: Hydroponic Plant Production and Other Means, a Review,
W79-01477 5C

NUTRIENT REQUIREMENTS
Wastewater Problems in the Food Processing Industry in the Light of Modern Water Management (Az elelmiszeripar szennyviz-problemai a korszeru vizgazdalkodas tukreben),
W79-01071 5D

NUTRIENTS
Modeling Pesticides and Nutrients on Agricultural Lands,
W79-01004 5B

Limnological Characteristics of the Potomac Estury,
W79-01195 5C

Persistent Blooms of Surf Diatoms Along the Northwest Coast,
W79-01200 5C

Transformations of Heavy Metals and Plant Nutrients in Dredged Sediments as Affected by Oxidation Reduction Potential and pH, Volume II: Materials and Methods/Results and Discussion,
W79-01201 5C

Nutrient Fluxes in Precipitation, Throughfall, and Stemflow in an Oak-Hickory Forest,
W79-01246 2I

Standing Crops of Marsh Vegetation of Two Tributaries of Chesapeake Bay,
W79-01433 2L

Evaluation of Clinoptilolite for Ammonia Removal,
W79-01464 5D

OCEANS
In Pursuit of Clean Oceans - A Review of the Marine Protection, Research, and Sanctuaries Act,
W79-01144 5G

Should the Law of the Sea Conference Be Saved,
W79-01157 6E

Seabed Resources and International Law,
W79-01158 6E

In Search of Common Nodules at UNCLOS III,
W79-01163 6E

OFFSHORE PLATFORMS
The Feasibility of Suspension Culture of Oysters (Crassostrea Virginica) at a Petroleum Platform off the Texas Coast,
W79-01024 5C

OIL
The Toxic Effects of the Water Soluble Fractions of No. 2 Fuel Oil and Three Aromatic Hydrocarbons on the Behavior and Survival of Barnacle Larvae,
W79-01025 5C

The National Energy Plan,
W79-01480 6B

OIL BOOMS
Oil Boom for Damming and Collecting a Floating Oil Slick,
W79-01394 5G

OIL POLLUTION
Oil Boom for Damming and Collecting a Floating Oil Slick,
W79-01394 5G

Methods and Compositions for Dispersing Oil Films,
W79-01407 5G

Effluent Oil Collecting Vessel,
W79-01419 5G

OIL SLICK SPREADING
Drift Velocity of Surface Films Over Waves,
W79-01139 5B

OIL SPILLS
Uptake and Release of Petroleum by Intertidal Sediments at Port Valdez, Alaska,
W79-01022 5B

Drift Velocity of Surface Films Over Waves,
W79-01139 5B

Federal Common Law and Ocean Pollution: A Private Remedy for Oil Pollution Damage,
W79-01150 5G

Oil Pollution Liability.
W79-01173 6E

Oil Boom for Damming and Collecting a Floating Oil Slick,
W79-01394 5G

OIL-WATER INTERFACES
Drift Velocity of Surface Films Over Waves,
W79-01139 5B

OILY WATER
Effluent Treatment Plant Cleans up Down the Valleys,
W79-01078 5D

Effluent Oil Collecting Vessel,
W79-01419 5G

OLD RIVER CONTROL STRUCTURE
Effect of Failure of the Old River Control Structure on Municipal and Industrial Water Supplies,
W79-01336 4A

OLIGOCHAETES
Importance of Algae in the Diet of the Oligochetes Lumbriculus Variegatus (Muller) and Rhyacodrilus Sodalis (Eisten),
W79-01453 5C

ON-SITE DATA COLLECTIONS
Some Observed Statistical Properties of Small Scale Turbulence,
W79-01055 2L

ON-SITE INVESTIGATIONS
Bed Forms and Stratification Types of Modern Gravel Meander Lobes, Nueces River, Texas,
W79-01044 2J

Heat and Thrust Requirements of a Thermal Fog Dispersal System,
W79-01058 3B

OPEN CHANNEL FLOW
Control of Transients in Series Channel with Gates,
W79-01255 8B

OPTIMAL FEEDBACK CONTROL
Synthesis of Optimal Feedback Control Systems for Fermentations and Biological Waste Treatment Processes,
W79-01428 5D

OPTIMIZATION
Optimal Operation of Large Agricultural Watersheds with Water Quality Constraints,
W79-01355 4D

Renewable Resource Management and Extinction,
W79-01495 6A

OREGON
Tap Water and Timber - The Costs of Multiple Use,
W79-01166 5G

ORGANIC CARBON
Dissolved Organic Carbon Fluxes in the Shetucket River of Eastern Connecticut, USA,
W79-01337 5C

ORGANIC COMPOUNDS
Organic Compounds in the Delaware River,
W79-01252 5B

Hydrocarbons in the Marine Environment of Port Valdex, Alaska,
W79-01254 5B

Organic Contaminants,
W79-01471 5C

ORGANIC MATTER
Sedimentation and Microbial Metabolism in a Shallow Estuary,
W79-01091 2J

Urban Runoff Pollution and Water Quality Planning,
W79-01134 5B

The Influence of Colloidal Organic Matter on Iron and Iron-Phosphorus Cycling in an Acid Bog Lake,
W79-01219 5C

ORGANIC WASTES
Biodeposition by Salt-Marsh Invertebrates,
W79-01288 5B

ORGANOCHLORINE COMPOUNDS
Chloro-Organics in Surface Water Sources for Potable Water,
W79-01472 5B

OTTER CREEK-DRY CREEK BASIN (NY)
Digital-Model Simulation of the Glacial-Outwash Aquifer, Otter Creek-Dry Creek Basin, Cortland County, New York,
W79-01377 2F

OUTFALL SEWERS
Geochemistry of Mercury in Palos Verdes Sediments,
W79-01250 5B

OVERDRAFT
Land Subsidence in the Santa Clara Valley,
W79-01365 2F

OVERLAND FLOW
Salt Pickup by Overland Flow in the Price River Basin, Utah,
W79-01245 5B

OWNERSHIP OF BEDS
In Search of Common Nodules at UNCLOS III,
W79-01163 6E

Status Report on Law of the Sea Conference.
W79-01176 6E

OXIDATION
Oxidation of Lyes and Treatment of Wastewater with Gaseous Oxygen (Okispenie shchelokov i obrabotka stochnykh vod gazoobraznym kislorodom),
W79-01083 5D

OXIDATION LAGOONS
The Dewatering of Lime-Algae Sludge on Sand Drying Beds,
W79-01349 5D

OXIDATION-REDUCTION POTENTIAL
Transformations of Heavy Metals and Plant Nutrients in Dredged Sediments as Affected by Oxidation Reduction Potential and pH, Volume II: Materials and Methods/Results and Discussion,
W79-01201 5C

OXYGEN DEPLETION
The Response of Empetrum Nigrum L. to Different Mire Water Regimes, with Special Reference to Wybunbury Moss, Cheshire and Featherbed Moss, Derbyshire,
W79-01293 5C

OXYGENATION
A Study for Improving the Aerobic-Media Trickling Filter for Wastewater Treatment,
W79-01123 5D

OYSTER RIVER (NH)
Electron Spin Resonance Analysis of Semiquinone Free Radicals of Aquatic and Soil Fulvic and Humic Acids,
W79-01133 5A

OYSTERS
Bioassays on Marine Organisms: Acute Toxicity Test of Mercury, Cadmium, and Copper to Arkshell, Anadara Broughtonii, from Jin-Dong Bay, and to Oyster, Crassostrea Gigas, from Kwangdo Bay, South Coast of Korea,
W79-01015 5C

The Feasibility of Suspension Culture of Oysters (Crassostrea Virginica) at a Petroleum Platform off the Texas Coast,
W79-01024 5C

OZONATION
Ozonation for Control of Enteric Viruses in Sewage Effluent,
W79-01088 5D

OZONE
Ozonation for Control of Enteric Viruses in Sewage Effluent,
W79-01088 5D

PACIFIC COAST REGION
Persistent Blooms of Surf Diatoms Along the Northwest Coast,
W79-01200 5C

The Impact of Logging on Salmonid Resources in the Pacific Northwest,
W79-01466 4C

PACIFIC NORTHWEST
Simulation of Soil Erosion in the Palouse Praine of the Pacific Northwest,
W79-01087 4D

PACIFIC NORTHWEST U.S.
Persistent Blooms of Surf Diatoms Along the Northwest Coast,
W79-01200 5C

PACIFIC OCEAN
Geochemistry of Mercury in Palos Verdes Sediments,
W79-01250 5B

PAINTS (WASTES)
Treating Paint Waste Solids,
W79-01416 5D

PALAEMONETES
The Influence of Temperature and Salinity on the Toxicity of Hexavalent Chromium to the Grass Shrimp Palaemonetes Pugio (Holthuis),
W79-01457 5C

PALO VERDES (CALIF)
Geochemistry of Mercury in Palos Verdes Sediments,
W79-01250 5B

PALOUSE PRAIRIE (IDA-WASH)
Simulation of Soil Erosion in the Palouse Praine of the Pacific Northwest,
W79-01087 4D

PAMLICO RIVER ESTUARY (NC)
Seasonal Growth and Decomposition of Vallisneria americana in the Pamlico River Estuary,
W79-01362 5C

PARALICHTHYS
Effect of Thermal Shock on Predator Avoidance by Larvae of Two Fish Species,
W79-01454 5C

PARAMETRIC HYDROLOGY
Parameter Identification in an Inhomogeneous Medium with Finite Element Method,
W79-01341 2F

PARR
The Behavior of Juvenile Atlantic Salmon (Salmo Salar) and Brook Trout (Salvelinus Fontinalis) with Regard to Temperature and to Water Velocity,
W79-01441 5C

PASSAIC RIVER (NJ)
Distribution of Autotrophic Nitrifying Bacteria in a Polluted River (the Passaic),
W79-01007 5B

PATENTS
Tidal Sampler,
W79-01388 7B

Self-Propelled Dredging Apparatus,
W79-01389 8C

Water Conduit,
W79-01390 3F

PATENTS

Recovery and Reuse of Paint Solids from Waste Water,
W79-01391 5D

Method and Device for Separation of Suspended Material from a Fluid Flow,
W79-01392 5D

System for Removal of Toxic Heavy Metals from Drinking Water,
W79-01393 5F

Oil Boom for Damming and Collecting a Floating Oil Slick,
W79-01394 5G

Water Sterilization Apparatus,
W79-01395 5F

Process for the Purification of Industrial Effluents,
W79-01396 5D

Method of Purification of Waste Water by Treatment with Zirconium Salt,
W79-01397 5D

Multiple Effect Evaporation of Water from Water Containing Combustible Sludges,
W79-01398 5E

Septic Tank-Leaching Pool Arrangement,
W79-01399 5D

Breakwater,
W79-01400 8A

Algaecidal Composition,
W79-01401 5F

Method of Purifying Water,
W79-01402 5F

Method of Treating Waste Water with Activated Sludge,
W79-01403 5D

Water Purification Process,
W79-01404 5D

Purification of Water for Boiler,
W79-01405 5F

Cationic Chlorine-Resistant Polymeric Flocculants and Their Use,
W79-01406 5D

Methods and Compositions for Dispersing Oil Films,
W79-01407 5G

Apparatus for Removing Mercury from Waste Water,
W79-01408 5D

Low Turbulence Settling Tank,
W79-01409 5D

Guidance Control System for Self-Propelled Mobile Sprinkler Irrigation Systems,
W79-01410 3F

Adjustable Height Sprinkler,
W79-01411 3F

Method of Treatment of an Oxidizable Material by a Biochemical Process,
W79-01412 5D

Method and Apparatus for the Biological Cleansing of Waste Water,
W79-01413 5D

Purification of Water by Reverse Osmosis Using a Supported Semi-Permeable Membrane,
W79-01414 5F

Method for Removing of Multivalent Heavy Metals from Metal Plating Waste Effluents,
W79-01415 5D

Treating Paint Waste Solids,
W79-01416 5D

Method for Sequestering Metal Ions,
W79-01417 5G

Apparatus for Use in Water Purification Particularly Sewage Treatments,
W79-01418 5D

Effluent Oil Collecting Vessel,
W79-01419 5G

Waste-Water Treatment System,
W79-01420 5D

PATH OF POLLUTANTS

Distribution of Autotrophic Nitrifying Bacteria in a Polluted River (the Passaic),
W79-01007 5B

Chlorinated Hydrocarbons in Marine Insects,
W79-01023 5B

Total Mercury and Methyl Mercury Contents in Fish from Lake Paijanne,
W79-01028 5C

Nitrate and Nitrite in the Surface Waters of Two Delaware Salt Marshes,
W79-01291 5B

Mixing and Dispersion in Estuaries,
W79-01338 5B

PATHOGENIC BACTERIA

The Importance of Water for the Spread of Potentially Pathogenic Mycobacteria: II. Growth of Mycobacteria in Water Models, (In German),
W79-01259 5C

PEAK DISCHARGE

Unsteady Flow Modeling of Dam-Break Waves,
W79-01268 8B

PENNSYLVANIA

Impact of Mine Drainage on a Mountain Stream in Pennsylvania,
W79-01017 5C

Effects of Chromium on Some Aquatic Plants,
W79-01031 5C

Philadelphia Chewing Gum Co. V. Commonwealth of Pennsylvania, Dept. of Environmental Resources (Land-Owners and Occupiers Liable for Correction of Polluting Condition).
W79-01191 6E

Organic Compounds in the Delaware River,
W79-01252 5B

PERFORMANCE

Effect of Copper and Tri- and Hexavalent Chromium on the Work of an Activated Sludge,
W79-01079 5D

PERIDINIUM CINTUM WESTII

Quantitative and Qualitative Changes in the Phytoplankton of Lake Kinneret, Israel, 1972-1975,
W79-01198 5C

PERIPHYTON

Additions to the Freshwater Algae of South Carolina,
W79-01203 5C

PERMAFROST

Approximate Calculation of Nonstationary Temperature Regime of a Rock-Ice Dam.
W79-01049 8D

Organization of Full-Scale Analyses of Filtration-Thermal Regime of Tailings Dams on Permafrost Foundations,
W79-01050 8D

Tailings Cofferdams on Permafrost Foundations in Yakutskaya ASSR,
W79-01051 8D

PERMEABILITY

Field Permeability Methods for In-Place Leaching,
W79-01111 2F

PERMITS

In Pursuit of Clean Oceans - A Review of the Marine Protection, Research, and Sanctuaries Act,
W79-01144 5G

Vested Rights to Develop Land: California's AVCO Decision and Legislative Responses,
W79-01148 6F

Coal Development and Reclamation - Planning and Conservation,
W79-01489 6B

PESTICIDE RESIDUES

Chlorinated Hydrocarbons in Marine Insects,
W79-01023 5B

Chlorinated Hydrocarbons and Mercury in Aquatic Vascular Plants of Lake Paijanne, Finland,
W79-01029 5C

PHENOLS

Photo-Decomposition of Aqueous Solutions of Phenol (Fenooru suiyoeki no hikari bunkai),
W79-01069 5D

PHOSPHATES

Comparison of Iron (III) and Aluminum in Precipitation of Phosphate from Solution,
W79-01095 5D

Fertilizing Fish Ponds: I. Chemistry of the Waters,
W79-01286 5C

PHOSPHORUS

The Influence of Colloidal Organic Matter on Iron and Iron-Phosphorus Cycling in an Acid Bog Lake,
W79-01219 5C

Nitrogen and Phosphorus Fertilization of Aquatic Vascular Plants and Algae in Replicated Ponds. I. Initial Response to Fertilization,
W79-01224 5C

Response in Production of Cord Grass, Spartina Alterniflora, to Inorganic Nitrogen and Phosphorus Fertilizer,
W79-01225 2L

A Chemical Budget of a Soft-Water Bog Lake: Benthic Contributions,
W79-01423 2H

PHOSPHORUS REMOVAL

Sensitivity Analysis of a Phosphorus Removal Strategy Computer Model,
W79-01310 5D

PHOTOPOTENTIALS

Polarization and Photopotentials of InSb in NaOH,
W79-01233 8G

PHOTOSYNTHESIS

Quantitative and Qualitative Changes in the Phytoplankton of Lake Kinneret, Israel, 1972-1975,
W79-01198 5C

PHOTOTACTIC BEHAVIOR
The Toxic Effects of the Water Soluble Fractions of No. 2 Fuel Oil and Three Aromatic Hydrocarbons on the Behavior and Survival of Barnacle Larvae,
W79-01025 5C

PHREATOPHYTES
An Energy Budget Analysis of Evapotranspiration from Saltcedar,
W79-01231 3B

PHYSICAL PROPERTIES
The Density of Seawater Solutions at One Atmosphere as a Function of Temperature and Salinity,
W79-01064 2K

The Effect of Several Physical and Chemical Factors Upon the Distribution of Benthic Macroinvertebrates in Dunham Pond, Connecticut,
W79-01330 5C

PHYTOPLANKTON
Quantitative and Qualitative Changes in the Phytoplankton of Lake Kinneret, Israel, 1972-1975,
W79-01198 5C

Additions to the Freshwater Algae of South Carolina,
W79-01203 5C

Suspension-Feeding Aquaculture Systems: Effects of Phytoplankton Concentration and Temperature on Growth of the Bay Scallop,
W79-01285 5C

PLANNING
Regional Water Supply Capacity Expansion with Seasonal Demands and Energy Costs,
W79-01002 6A

The Ordinary High Water Mark: Attempts at Settling an Unsettled Boundary Line,
W79-01009 6E

Urban Runoff Pollution and Water Quality Planning,
W79-01134 5B

Public Involvement in Natural Resource Development: A Review of Water Resource Planning,
W79-01153 6B

Soil Erosion Control Policies - Institutional Alternatives and Costs,
W79-01164 5G

Trade Off Analysis in Environmental Decision-making: An Alternative to Weighted Decision Models,
W79-01242 6G

Conference Proceedings - A Critical Economic Balance, Water - Land - Energy - People - Held at Colorado State University, Pingree Park Campus on June 6-7, 1977,
W79-01478 6B

Coordinated Energy Management,
W79-01479 6B

The National Energy Plan,
W79-01480 6B

Legitimacy of Western Identity in an Economic Balance Water - Land - Energy - People,
W79-01481 6B

Fragile Lands and People,
W79-01487 6B

An Economic Evaluation of Cropland Use as a Control for Sediment Nonpoint Pollution,
W79-01498 5G

PLANT GROWTH
Effects of Chromium on Some Aquatic Plants,
W79-01031 5C

Relationships Between Mineral Supply and Growth of Narthecium Ossifragum (L.) Huds. on Mire Ecosystems,
W79-01216 2H

Growth and Resource Allocation Responses of Spartina Alterniflora Loisel to Three Levels of NH sub 4-N, FE, and NACL in Solution Culture,
W79-01294 2I

Phosphorus Cycling in Nuphar luteum Communities in the Lower Chowan River, North Carolina,
W79-01326 5C

Effects of Chelated Iron on the Growth of Two Species of Vallisneria,
W79-01446 5C

PLANT PHYSIOLOGY
Cycling of Elements in Duckweed (Lemna Perpusilla) in an Ash Settling Basin and Swamp Drainage System,
W79-01458 5C

PLANT POPULATIONS
Changes in Submerged Aquatic Macrophyte Populations at the Head of Chesapeake Bay, 1958-1975,
W79-01030 5C

PLANT TISSUES
Chlorinated Hydrocarbons and Mercury in Aquatic Vascular Plants of Lake Paijanne, Finland,
W79-01029 5C

PLANT VIRUSES
Ultrastructure of the Blue-Green Alga Anacystis Nidulans Infected with AS-1 Virus,
W79-01334 5C

PLASTIC PIPES
A Look at RPM Plastic,
W79-01114 8G

PODZOL SOIL
Electron Spin Resonance Analysis of Semiquinone Free Radicals of Aquatic and Soil Fulvic and Humic Acids,
W79-01133 5A

POLARAGRAPHIC ANALYSIS
Evaluation of Micromolar Complexiметric Titrations for the Determination of the Complexing Capacity of Natural Waters,
W79-01344 5A

Determination of the Complexing Capacity of Natural Water by Cobalt (III) Complexation,
W79-01345 5A

POLARIZATION
Potentiodynamic Studies of Antimony in Acidic and Alkaline Solutions,
W79-01232 8G

Polarization and Photopotentials of InSb in NaOH,
W79-01233 8G

Hydrogen Evolution and Corrosion Behavior of Fe-Ni Alloys in H2SO4 - Effect of Temperature, C1- and Benzatriazole,
W79-01235 8G

Electrochemical Behavior of Rotating Iron Disks Effect of FE(111),
W79-01281 8G

Polarization at Membrane/Solution Interfaces,
W79-01342 3A

POLICY
Coordinated Energy Management,
W79-01479 6B

The National Energy Plan,
W79-01480 6B

Regional - Implications - Overview of National Energy Employment Relations,
W79-01483 6B

The Industry's Role in Energy Management,
W79-01484 6B

An Economic Evaluation of Cropland Use as a Control for Sediment Nonpoint Pollution,
W79-01498 5G

POLITICAL ASPECTS
An Alternative Perspective on Common Property Resource Allocation Decisions in the Coastal Zone,
W79-01494 6A

POLLUTANT IDENTIFICATION
Precision Analysis for Waterborne Chrysotile Asbestos by Transmission Electron Microscopy,
W79-01010 5A

Uptake and Release of Petroleum by Intertidal Sediments at Port Valdez, Alaska,
W79-01022 5B

Ion Exchange Membrane Methods for Continuous Removal of Ions from Water and Trace Chemical Analysis,
W79-01327 5A

Evaluation of Micromolar Complexiметric Titrations for the Determination of the Complexing Capacity of Natural Waters,
W79-01344 5A

Determination of the Complexing Capacity of Natural Water by Cobalt (III) Complexation,
W79-01345 5A

POLLUTANTS
Organic Contaminants,
W79-01471 5C

Use of Unicellular Algae for Evaluation of Potential Aquatic Contaminants,
W79-01476 5A

Market Input/Output Studies. Task I. Vinylidene Chloride,
W79-01500 6B

POLLUTION ABATEMENT
Philadelphia Chewing Gum Co. V. Commonwealth of Pennsylvania, Dept. of Environmental Resources (Land-Owners and Occupiers Liable for Correction of Polluting Condition).
W79-01191 6E

Analysis of Economic Effect of Environmental Regulations on Integrated Iron and Steel Industry. Volume II,
W79-01194 5G

Effects of Selected Changes in the Institutional and Human Environment Upon Output Per Unit of Input,
W79-01491 6B

A Note on the Use of Taxes to Control Pollution,
W79-01496 5G

The 'Standards and Price' Approach to Pollution Control: Problems of Iteration,
W79-01497 5G

POLLUTION TAXES (CHARGES)
A Note on the Use of Taxes to Control Pollution,
W79-01496 5G

The 'Standards and Price' Approach to Pollution Control: Problems of Iteration,
W79-01497 5G

The Response of Firms to Pollution Charges,
W79-01499 5G

POLYCHAETES
Influence of Sediment in Copper Toxicity Tests with the Polychaete Neanthes Arenaceodentata,
W79-01460 5A

POLYCHLORINATED BIPHENYLS
Effect of DDT and Polychlorinated Biphenyls on Cell Population Growth of Crithidia Fasciculata, A Flagellated Protozoan,
W79-01013 5C

Chlorinated Hydrocarbons in Marine Insects,
W79-01023 5B

Chlorinated Hydrocarbons and Mercury in Aquatic Vascular Plants of Lake Paijanne, Finland,
W79-01029 5C

Metabolism of Polychlorinated Biphenyls by Marine Bacteria,
W79-01443 5C

POLYHALOGENATED 1-OCTENE-3-ONES
Polyhalogenated 1-Octene-3-Ones, Antibacterial Metabolites from the Red Seaweed Bonnemaisonia Asparagoides,
W79-01204 5C

POLYMERS
Market Input/Output Studies. Task I. Vinylidene Chloride,
W79-01500 6B

PONDEROSA PINE TREES
Characteristics of Arizona Ponderosa Pine Stands on Sandstone Soils,
W79-01099 2I

PONDS
Additions to the Freshwater Algae of South Carolina,
W79-01203 5C

PORT VALDEZ (ALAS)
Uptake and Release of Petroleum by Intertidal Sediments at Port Valdez, Alaska,
W79-01022 5B

PORT VALDEZ (ALASKA)
Hydrocarbons in the Marine Environment of Port Valdez, Alaska,
W79-01254 5B

POTABLE WATER
Underground Injection Program Set Under Safe Drinking Water Act,
W79-01154 5G

Injurious Effect of Tap Water on Rooting of Cuttings of Bryophyllum Calycinum,
W79-01221 5C

A Pilot Study of Drinking Water Systems On and Along the National System of Interstate and Defense Highways.
W79-01312 5F

A Manual for the Evaluation of a State Drinking Water Supply Program,
W79-01313 5F

Water-Quality Indices for Specific Water Uses,
W79-01381 5G

Chloro-Organics in Surface Water Sources for Potable Water,
W79-01472 5B

POTATOES
Addition of Potato Protein Recovered from Potato Starch Factory Waste Effluents for Bread,
W79-01073 5E

POTOMAC ESTUARY
Limnological Characteristics of the Potomac Estury,
W79-01195 5C

POWER LINES
Waterfowl Collisions with Power Lines at a Coal-Fired Power Plant,
W79-01434 6G

POWER SYSTEM OPERATION
Waterfowl Collisions with Power Lines at a Coal-Fired Power Plant,
W79-01434 6G

PRE-MANAGEMENT
Pre-Management Assessment of Aquatic Macroinvertebrates in a Small, Sedimentary Drainage Area of the Maumee and Lake Erie Basin.
W79-01096 5C

PRECIPITATION (ATMOSPHERIC)
Correlations Between Maximum Rate of Precipitation and Mesoscale Parameters,
W79-01036 2B

Parameterization of Sulfate Removal by Precipitation,
W79-01038 5B

Prediction of Convective Activity Using a System of Parasitic-Nested Numerical Models,
W79-01056 2B

Nutrient Fluxes in Precipitation, Throughfall, and Stemflow in an Oak-Hickory Forest,
W79-01246 2I

Generation of Daily Precipitation Over an Area,
W79-01261 2B

Time Averaged Areal Mean of Precipitation: Estimation and Network Design,
W79-01357 2B

The Slope of Gran's Plot: A Useful Function in the Examination of Precipitation, the Water-Soluble Part of Airborne Particles, and Lake Water,
W79-01474 5A

PREDATION
Effect of Thermal Shock on Predator Avoidance by Larvae of Two Fish Species,
W79-01454 5C

PRICE RIVER BASIN (UTAH)
Salt Pickup by Overland Flow in the Price River Basin, Utah,
W79-01245 5B

PRIMARY PRODUCTIVITY
Primary Production in a Shallow Water Lake with Special Reference to a Reed Swamp,
W79-01223 5C

Primary Production of Edaphic Algal Communities in a Delaware Salt Marsh,
W79-01296 5C

PRIVATE SECTOR
An Alternative Perspective on Common Property Resource Allocation Decisions in the Coastal Zone,
W79-01494 6A

PROBABILITY
Stochastic Modeling of Monthly and Daily Rainfall Sequences,
W79-01244 2B

PRODUCTION
Response in Production of Cord Grass, Spartina Alterniflora, to Inorganic Nitrogen and Phosphorus Fertilizer,
W79-01225 2L

PRODUCTIVITY
Production and Dynamics of Experimentally Enriched Salt Marsh Vegetation: Belowground Biomass,
W79-01222 5C

PROJECT PLANNING
Public Involvement in Natural Resource Development: A Review of Water Resource Planning,
W79-01153 6B

PROTEINS
Addition of Potato Protein Recovered from Potato Starch Factory Waste Effluents for Bread,
W79-01073 5E

PROTOZOA
Effect of DDT and Polychlorinated Biphenyls on Cell Population Growth of Crithidia Fasciculata, A Flagellated Protozoan,
W79-01013 5C

PRUDHOE BAY AREA (ALAS)
A Preliminary Survey of the Zooplankton and Benthos of an Arctic Lake Near Prudhoe Bay, Alaska,
W79-01427 2H

PUBLIC HEALTH
Aquatic Weed Management: Some Prospects for the Sudan and the Nile Basin, Report of a Workshop Held at Khartoum, Sudan on 24-29 November 1975.
W79-01205 5G

PUBLIC LANDS
City of Berkely V. Superior Court for the County of Alameda (Additional Adjudication Issues Need to Determine if Land Subject to Public 'Tideland Trust'),
W79-01189 6E

PUBLIC SECTOR
An Alternative Perspective on Common Property Resource Allocation Decisions in the Coastal Zone,
W79-01494 6A

PUBLIC WATER SUPPLIES
Water-Quality Indices for Specific Water Uses,
W79-01381 5G

PULP AND PAPER INDUSTRY
Oxidation of Lyes and Treatment of Wastewater with Gaseous Oxygen (Okispenie shchelokov i obrabotka stochnykh vod gazoobraznym kislorodom),
W79-01083 5D

Investigations of the Decoloration of Wastewaters Generated in Conifer Sulfate Pulp Mills (Cercetari privind decolorarea apelor reziduale provenite de la fabricarea celulozei sulfat din rasinoase),
W79-01084 5D

Laboratory Investigation of Water Pollution by Organic Substances in Flax Wastes Delignification (Laboratorne sledovanie organickeho znecistenia vod pri delignifikacii lanovych odpadov),
W79-01085 5B

PULP WASTES
Oxidation of Lyes and Treatment of Wastewater with Gaseous Oxygen (Okispenie shchelokov i obrabotka stochnykh vod gazoobraznym kislorodom),
W79-01083 5D

Investigations of the Decoloration of Wastewaters Generated in Conifer Sulfate Pulp Mills (Cercetari privind decolorarea apelor reziduale provenite de la fabricarea celulozei sulfat din rasinoase),
W79-01084 5D

Laboratory Investigation of Water Pollution by Organic Substances in Flax Wastes Delignification (Laboratorne sledovanie organickeho znecistenia vod pri delignifikacii lanovych odpadov),
W79-01085 5B

Removal of Soluble BOD sub 5 Primary Clarifiers,
W79-01317 5D

A Biological Assessment of Fish and Benthic Populations Inhabiting a Kraft Mill Effluent Channel,
W79-01448 5C

PUMPS
Gas-Driven Pump for Ground-Water Supplies,
W79-01378 8C

QUABOAG POND (MA)
Quaboag and Quacumquasit Ponds, Water Quality Study, April 1974-April 1975,
W79-01202 5C

QUACUMQUASIS POND (MA)
Quaboag and Quacumquasit Ponds, Water Quality Study, April 1974-April 1975,
W79-01202 5C

QUAE YAI RIVER (THAILAND)
Stochastic Modeling of Monthly and Daily Rainfall Sequences,
W79-01244 2B

RADAR
The Relationship Between Radar Reflectivity Factor and Hail at the Ground for Northeast Colorado Thunderstorms,
W79-01037 7B

RADIOACTIVE WASTES
Impact of the Schwartzwalder Mine on the Water Quality of Ralston Creek, Ralston Reservoir, and Upper Long Lake.
W79-01207 5B

Evaluation of the Impact of the Mines Development, Incorporated Mill on Water Quality Conditions in the Cheyenne River.
W79-01209 5B

RADIOACTIVITY EFFECTS
Chronic Exposure of Chinook Salmon Eggs and Alevins to Gamma Irradiation: Effects on Their Return to Freshwater as Adults,
W79-01455 5C

RADIOCHROMATOGRAPHY
Metabolism of Polychlorinated Biphenyls by Marine Bacteria,
W79-01443 5C

RAILROADS
Meeker v. City of Clinton (Flood Damages Caused by Municipal and Railroad Negligence),
W79-01181 6E

Right to Construct Dams and Raise Water-Conducting Water Over Lands and Railroad Rights of Way,
W79-01185 6E

RAINFAL
Characteristics of Rainfall Conditions with Particular Reference to North East England,
W79-01267 2B

RAINFALL
Correlations Between Maximum Rate of Precipitation and Mesoscale Parameters,
W79-01036 2B

Geochemical Implications of Summer Monsonal Rainwater Composition Over India,
W79-01039 2K

Stochastic Modeling of Monthly and Daily Rainfall Sequences,
W79-01244 2B

Time Averaged Areal Mean of Precipitation: Estimation and Network Design,
W79-01357 2B

RAINFALL DISPOSITION
Characteristics of Rainfall Conditions with Particular Reference to North East England,
W79-01247 2B

RAINFALL-RUNOFF RELATIONSHIPS
Water Resources of the Upper Henrys Fork Basin in Eastern Idaho.
W79-01364 6D

RANGE MANAGEMENT
Evaluation of Wild Oat Straw as a Soil Erosion Retardant Using Simulated Rainfall,
W79-01131 4D

REAERATION
Reaeration Performance of Stepped Cascades,
W79-01249 5G

RECLAIMED WATER
Direct Injection of Reclaimed Water into an Aquifer,
W79-01108 5D

Apollo County Park Wastewater Reclamation Project, Antelope Valley, California,
W79-01324 5D

RECLAMATION
Metallic Mining Reclamation Act,
W79-01188 6E

Coal Development and Reclamation - Planning and Conservation,
W79-01489 6B

RECREATION
Non-Resident Hunters--Benefactors or Bad Men.
W79-01138 6B

Feasibility Study, Fly Ash Reclamation of Surface Mines, Hillman State Park, Feasibility Study,
W79-01323 5G

Apollo County Park Wastewater Reclamation Project, Antelope Valley, California,
W79-01324 5D

Quantification of Recreational Use of the Coralville Reservoir,
W79-01361 6B

Economic Value of Hunting, Fishing, and General Rural Outdoor Recreation,
W79-01430 6B

RECYCLING
Addition of Potato Protein Recovered from Potato Starch Factory Waste Effluents for Bread,
W79-01073 5E

Implementing 'Best Management Practices' for Residuals: The Waste Exchange,
W79-01309 5G

An Assessment of Technology for Possible Utilization of Bayer Process Muds,
W79-01315 5D

Automated Treatment and Recycle of Swine Feedlot Wastewaters,
W79-01316 5D

Seasonal Growth and Decomposition of Vallisneria americana in the Pamlico River Estuary,
W79-01362 5C

Resource Extraction and Recycling with Environmental Costs,
W79-01492 6A

REDOX-ACTIVE CHEMICAL
A Chemical Budget of a Soft-Water Bog Lake: Benthic Contributions,
W79-01423 2H

REGENERATION
Purification of Water for Boiler,
W79-01405 5F

REGIONAL ANALYSIS
Regional Geology Series: Part X,
W79-01115 2F

REGIONAL DEVELOPMENT
Principles for Water Quality Management,
W79-01165 5G

Energy and the Colorado River,
W79-01167 3E

Conference Proceedings - A Critical Economic Balance, Water - Land - Energy - People - Held at Colorado State University, Pingree Park Campus on June 6-7, 1977,
W79-01478 6B

Legitimacy of Western Identity in an Economic Balance Water - Land - Energy - People,
W79-01481 6B

Regional - Implications - Overview of National Energy Employment Relations,
W79-01483 6B

Critique of the Challenges,
W79-01486 6B

Viewpoint from the Capital Market,
W79-01488 6B

REGIONAL ECONOMICS
Legitimacy of Western Identity in an Economic Balance Water - Land - Energy - People,
W79-01481 6B

REGRESSION ANALYSES
Relationships Between Mineral Supply and Growth of Narthecium Ossifragum (L.) Huds. on Mire Ecosystems,
W79-01216 2H

REGRESSION ANALYSIS
Low-Flow Characteristics of Streams in the Rock-Fox River Basin, Wisconsin,
W79-01366 2E

REGULATION
The Fox in the Chicken Coop: The Regulatory Program of the U.S. Army Corps of Engineers,
W79-01141 6E

Vested Rights to Develop Land: California's AVCO Decision and Legislative Responses,
W79-01148 6F

Guidelines for Mandatory Erosion Control Programs,
W79-01160 5G

Water Resources and Other Related Laws of Illinois.
W79-01168 6E

Water Contamination by Toxic Pollutants: An Assessment of Regulation,
W79-01174 6E

REGULATION

Rules and Procedure for Coastal Construction and Excavation.
W79-01186 6E

Analysis of Economic Effect of Environmental Regulations on Integrated Iron and Steel Industry. Volume II,
W79-01194 5G

An Economic Evaluation of Cropland Use as a Control for Sediment Nonpoint Pollution,
W79-01498 5G

REMEDIES

Federal Common Law and Ocean Pollution: A Private Remedy for Oil Pollution Damage,
W79-01150 5G

Up to Our Wastes in Wet Suits: The Federal Law on Water Pollution,
W79-01161 5G

REMOTE SENSING

Acoustic Doppler Sounding of Falling Snow,
W79-01034 2C

The Relationship Between Radar Reflectivity Factor and Hail at the Ground for Northeast Colorado Thunderstorms,
W79-01037 7B

Remote Sensing of Water Levels in Small-Diameter Wells,
W79-01101 7B

Microwave Remote Sensing of Sea Ice in the Aidjex Main Experiment,
W79-01386 2C

RENEWABLE RESOURCES

Renewable Resource Management and Extinction,
W79-01495 6A

RENOVATION

Characteristics of Small Mammal Populations in Forested and Old Field Habitats Prior to Effluent Spray Irrigation,
W79-01331 5C

REPLACEMENT REACTIONS

Removal of Metallic Impurities from Water by Electrochemical Methods,
W79-01121 5D

RESEARCH PRIORITIES

Water Quality: Problems and Research Needs,
W79-01348 6B

Critique of the Challenges,
W79-01486 6B

Critique and Challenges,
W79-01490 6B

RESERVOIRS

Regional Water Supply Capacity Expansion with Seasonal Demands and Energy Costs,
W79-01002 6A

The Effects of Land Use on Phosphorus Loading: A Case Study - Six Mile Run Reservoir,
W79-01086 5C

Control of Transients in Series Channel with Gates,
W79-01255 8B

Simplified Routing through Reservoir,
W79-01266 4A

Simulation of Dam Break Flooding Under Normal and Probable Maximum Flood Conditions,
W79-01277 8B

Coralville Water Quality Study Annual Report, Water Year October 1, 1975 to September 30, 1976,
W79-01473 5B

RESINS

Recovery of Nitrosamines from Water,
W79-01006 5D

Electrochemical Purification of Wastewaters, Containing Polyester Resin (Elektrokhimicheskaya ochistka stochnykh vod, soderzhashchikh poliefirnuyu smolu),
W79-01066 5D

Cyclic Performance of Layered Beds for Binary Ion Exchange,
W79-01339 3A

RESISTANCE

Effect of Dibasol and Vitamin B12 on the Larvae of Aurelia Aurita (Soyphoza) in a Reduced Saline Medium,
W79-01451 5C

Effect of Thermal Shock on Predator Avoidance by Larvae of Two Fish Species,
W79-01454 5C

RESOURCE ALLOCATION

Seabed Resources and International Law,
W79-01158 6E

An Alternative Perspective on Common Property Resource Allocation Decisions in the Coastal Zone,
W79-01494 6A

RESOURCE DEVELOPMENT

Indians and the Environment: An Examination of Jurisdictional Issues Relative to Environmental Management,
W79-01143 6E

RESOURCE EXTRACTION

Resource Extraction and Recycling with Environmental Costs,
W79-01492 6A

RESOURCE INPUTS

A Note on the Use of Taxes to Control Pollution,
W79-01496 5G

RESOURCE SUBSTITUTION

Resource Extraction and Recycling with Environmental Costs,
W79-01492 6A

RESOURCES DEVELOPMENT

Economic Value of Hunting, Fishing, and General Rural Outdoor Recreation,
W79-01430 6B

RESPIRATION

Effects of Kelthane and Temperature on the Respiration of Crangon Franciscorum,
W79-01241 5C

RETURN FLOW

Nitrogen and Irrigation Management to Reduce Return-Flow Pollution in the Columbia Basin,
W79-01001 5G

REVEGETATE BITUMINOUS SPOIL BANKS

Wastewater Recycling on Forest Lands,
W79-01424 5D

REVENUE VALUE

Economic Value of Hunting, Fishing, and General Rural Outdoor Recreation,
W79-01430 6B

REVERSE OSMOSIS

Addition of Potato Protein Recovered from Potato Starch Factory Waste Effluents for Bread,
W79-01073 5E

Treatment of Wastewaters Generated in Electroplating Shops by Reverse Osmosis. (1. Concentration of Washing Waters from Nickel-Plating Processes) (Ochistka stokov gal'vanotsekhov metodom obratnogo osmosa (1. kontsentrirovanie promyvnkh vod nikelirovaniya),
W79-01077 5D

Treatment of Electroplating Wastes by Reverse Osmosis,
W79-01320 5D

Polarization at Membrane/Solution Interfaces,
W79-01342 3A

The Role of Membrane Methods in the Desalination of Brackish Water,
W79-01343 3A

Purification of Water by Reverse Osmosis Using a Supported Semi-Permeable Membrane,
W79-01414 5F

REVIEWS

Proceedings of Dam-Break Flood Routing Model Workshop.
W79-01262 8B

Comparative Analysis of Routing Techniques for the Floodwave from a Ruptured Dam,
W79-01272 8B

Chloro-Organics in Surface Water Sources for Potable Water,
W79-01472 5B

Nutrient Recovery from Farm Ponds: Hydroponic Plant Production and Other Means, a Review,
W79-01477 5C

RHODE ISLAND

Fatty Acid Composition of Organic Detritus from Spartina Alterniflora,
W79-01332 5C

RHYACODRILUS

Importance of Algae in the Diet of the Oligochetes Lumbriculus Variegatus (Muller) and Rhyacodrilus Sodalis (Eisten),
W79-01453 5C

RICE

Cadmium Availability to Rice in Sludge-Amended Soil Under 'Flood' and 'Nonflood' Culture,
W79-01127 5E

RIGHT-OF-WAY

Right to Construct Dams and Raise Water-Conducting Water Over Lands and Railroad Rights of Way,
W79-01185 6E

RIO GRANDE RIVER (N MEX)

An Energy Budget Analysis of Evapotranspiration from Saltcedar,
W79-01231 3B

RIPARIAN RIGHTS

Riparian Rights Under the Texas Water Rights Adjudication Act - A Constitution Analysis,
W79-01140 6E

Matter of the Waters of Long Valley Creek System (Prospective Riparian Rights Cannot be Denied or Quantified by State Water Resources Board),
W79-01184 6E

Warrior, Inc. V. Easterly (Developer Assessed Damages Caused by Excess Drainage Water and Debris Polluting Landowner's Pond,
W79-01192 6E

RIVER BASIN DEVELOPMENT
The Tennessee Valley Authority's Tellico Dam Project-Costs, Alternatives, and Benefits.
W79-01193 6B

RIVER BEDS
Bed Forms and Stratification Types of Modern Gravel Meander Lobes, Nueces River, Texas,
W79-01044 2J

RIVER KHAN (INDORE)
Pollution Studies of River Khan (Indore) India -- I. Biological Assessment of Pollution,
W79-01018 5A

RIVERS
Dissolved Mercury in the Lake Windermere Catchment Area,
W79-01040 5B

Exceptional Tolerance to Low pH of some Tropical Blackwater Fish,
W79-01098 5C

Organic Compounds in the Delaware River,
W79-01252 5B

The Dam-Break Wave and the Bore Collapse on a Beach,
W79-01263 8B

RIVERS AND HARBORS ACT
Up to Our Wastes in Wet Suits: The Federal Law on Water Pollution,
W79-01161 5G

ROCK-FOX RIVER BASIN
Low-Flow Characteristics of Streams in the Rock-Fox River Basin, Wisconsin,
W79-01366 2E

ROCKFILL DAMS
Approximate Calculation of Nonstationary Temperature Regime of a Rock-Ice Dam.
W79-01049 8D

ROCKY MOUNTAIN REGION
Conference Proceedings - A Critical Economic Balance, Water - Land - Energy - People - Held at Colorado State University, Pingree Park Campus on June 6-7, 1977,
W79-01478 6B

Population Growth and Socio-Economic Balance: How to Visualize Alternative Futures,
W79-01485 6B

Fragile Lands and People,
W79-01487 6B

ROOTED AQUATIC PLANTS
The Ecotone Between Spartina Folisoa Trin. and Salicornia Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay, I. Biomass and Production,
W79-01217 2L

Transplantation of Salt Marsh Vegetation. II. Georgetown, South Carolina,
W79-01306 2L

Phosphorus Cycling in Nuphar luteum Communities in the Lower Chowan River, North Carolina,
W79-01326 5C

ROOTS
Injurious Effect of Tap Water on Rooting of Cuttings of Bryophyllum Calycinum,
W79-01221 5C

ROTARY DRILLING
Mud and Clay,
W79-01120 8G

RUNOFF
Characteristics of Rainfall Conditions with Particular Reference to North East England,
W79-01247 2B

Runoff from Hydrologic Units in Florida,
W79-01368 7C

RUNOFF FORECASTING
Estimation of Water Balance of Lower Sutlej Catchment Up to Bhakra Dam Site by Thornthwaite's Method,
W79-01257 4A

SAFETY FACTORS
Effects of Selected Changes in the Institutional and Human Environment Upon Output Per Unit of Input,
W79-01491 6B

SALINE WATER
Specification of Cellulose Acetate to be Used in Semipermeable Membranes,
W79-01129 3A

Electrodissolution of Nickel in Molten LiCl-KCl,
W79-01234 8G

SALINE WATER-FRESHWATER INTERFACES
Mixing and Dispersion in Estuaries,
W79-01338 5B

Hydrologic Impact of Land Drainage on Estuaries,
W79-01385 4A

SALINITY
The Density of Seawater Solutions at One Atmosphere as a Function of Temperature and Salinity,
W79-01064 2K

Corn and Alfalfa Production as Influenced by Irrigation and Salinity,
W79-01136 3C

The Ecotone Between Spartina Foliosa Trin. and Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay: II. Soil Water and Salinity,
W79-01218 2L

Salt Pickup by Overland Flow in the Price River Basin, Utah,
W79-01245 5B

Growth and Resource Allocation Responses of Spartina Alterniflora Loisel to Three Levels of NH sub 4-N, FE, and NACL in Solution Culture,
W79-01294 2I

Seasonal Growth and Decomposition of Vallisneria americana in the Pamlico River Estuary,
W79-01362 5C

Effect of Dibasol and Vitamin B12 on the Larvae of Aurelia Aurita (Soyphoza) in a Reduced Saline Medium,
W79-01451 5C

The Influence of Temperature and Salinity on the Toxicity of Hexavalent Chromium to the Grass Shrimp Palaemonetes Pugio (Holthuis),
W79-01457 5C

SALMANDERS
Can Salamanders and Frogs Survive the Threat of Acid Precipitation,
W79-01005 5C

SALMON
The Impact of Logging on Salmonid Resources in the Pacific Northwest,
W79-01466 4C

SALT INJURY
Effect of Soil Application of Dairy Manure on Germination and Emergence of Some Selected Crops,
W79-01236 5C

SALT MARSH
Nitrogen Accretion, and the Nature and Possible Significance of N2 Fixation (Acetylene Reduction) in a Nova Scotian Spartina Alterniflora Stand,
W79-01214 5C

Growth and Resource Allocation Responses of Spartina Alterniflora Loisel to Three Levels of NH sub 4-N, FE, and NACL in Solution Culture,
W79-01294 2I

SALT MARSHES
The Ecotone Between Spartina Folisoa Trin. and Salicornia Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay, I. Biomass and Production,
W79-01217 2L

The Ecotone Between Spartina Foliosa Trin. and Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay: II. Soil Water and Salinity,
W79-01218 2L

Man's Impact on the Barrier Islands of North Carolina,
W79-01220 6G

Production and Dynamics of Experimentally Enriched Salt Marsh Vegetation: Belowground Biomass,
W79-01222 5C

The Ecotone Between Spartina Foliosa Trin. and Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay: III. Soil Aeration and Tidal Immersion,
W79-01283 2L

Biodeposition by Salt-Marsh Invertebrates,
W79-01288 5B

Growth and Mortality of Littorina Irrorata Say in Three North Carolina Marshes,
W79-01289 2L

Nitrate and Nitrite in the Surface Waters of Two Delaware Salt Marshes,
W79-01291 5B

Primary Production of Edaphic Algal Communities in a Delaware Salt Marsh,
W79-01296 5C

Transplantation of Salt Marsh Vegetation. II. Georgetown, South Carolina,
W79-01306 2L

Distribution of Bluegreen Algae in a Mississippi Gulf Coast Salt Marsh,
W79-01356 5B

SALTON SEA (CALIFORNIA)
Sand Transport Model of Barchan Dune Equilibrium,
W79-01043 2J

SALTS
Geochemical Implications of Summer Monsonnal Rainwater Composition Over India,
W79-01039 2K

SAMPLING
Dissolved Mercury in the Lake Windermere Catchment Area,
W79-01040 5B

An Improved Hydrazine Reduction Method for the Automated Determination of Low Nitrate Levels in Freshwater,
W79-01042 5A

Field Study of Sediment Transport Characteristics of the Mississippi River near Fox Island (RM 355-6) and Buzzard Island (RM 349-50),
W79-01065 2J

Boring and Sampling Techniques,
W79-01103 8G

The Effect of Some Basic Statistical and Biological Principles on Water Pollution Control,
W79-01243 5G

Distribution of Bluegreen Algae in a Mississippi Gulf Coast Salt Marsh,
W79-01356 5B

Gas-Driven Pump for Ground-Water Supplies,
W79-01378 8C

Tidal Sampler,
W79-01388 7B

SAN FRANCISCO BAY
The Ecotone Between Spartina Folisoa Trin. and Salicornia Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay, I. Biomass and Production,
W79-01217 2L

The Ecotone Between Spartina Foliosa Trin. and Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay: II. Soil Water and Salinity,
W79-01218 2L

The Ecotone Between Spartina Foliosa Trin. and Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay: III. Soil Aeration and Tidal Immersion,
W79-01283 2L

SAN FRANCISCO BAY AREA (CALIF)
Land Subsidence in the Santa Clara Valley,
W79-01365 2F

SAN JUAN MOUNTAINS (COLO)
Randomized Cloud Seeding in the San Juan Mountains, Colorado,
W79-01035 3B

SAND DRYING BEDS
The Dewatering of Lime-Algae Sludge on Sand Drying Beds,
W79-01349 5D

SAND FILTERS
The Effectiveness of Sand Filters for the Removal of Specific Viruses from Water Using Selected Cations as Filter Aids,
W79-01352 5D

SANDSTONES
Characteristics of Arizona Ponderosa Pine Stands on Sandstone Soils,
W79-01099 2I

SANTA CLARA VALLEY (CALIF)
Land Subsidence in the Santa Clara Valley,
W79-01365 2F

SAPROBIC SYSTEM
Pollution Studies of River Khan (Indore) India -- I. Biological Assessment of Pollution,
W79-01018 5A

SAVANNAH RIVER
Thermal Alterations of Aquatic Ecosystems,
W79-01284 5C

SCALING
Scaling and Corrosion in an Experimental Geothermal Power Plants,
W79-01106 3C

High-Temperature Solubilities of Calcium Sulfate Hemihydrate and Anhydrite in Natural Seawater Concentrates,
W79-01128 3A

Method for Sequestering Metal Ions,
W79-01417 5G

SCALLOPS
Suspension-Feeding Aquaculture Systems: Effects of Phytoplankton Concentration and Temperature on Growth of the Bay Scallop,
W79-01285 5C

SEA ICE
Microwave Remote Sensing of Sea Ice in the Aidjex Main Experiment,
W79-01386 2C

SEA-ICE TYPES
Microwave Remote Sensing of Sea Ice in the Aidjex Main Experiment,
W79-01386 2C

SEA WATER
The Density of Seawater Solutions at One Atmosphere as a Function of Temperature and Salinity,
W79-01064 2K

High-Temperature Solubilities of Calcium Sulfate Hemihydrate and Anhydrite in Natural Seawater Concentrates,
W79-01128 3A

SEASONAL
Abundance, Diversity, and Stability in Shore-Zone Fish Communities in an Area of Long Island Sound Affected by the Thermal Discharge of a Nuclear Power Station,
W79-01021 5C

The Effect of Temperature on the Development of Diapausing and Subitaneous Eggs in Several Freshwater Copepods,
W79-01033 5C

Monthly Determinations of the Concentrations of Sodium, Potassium, Magnesium and Calcium in the Rain and Pools of the Silver Flowe National Nature Reserve.
W79-01212 2K

Effect of Long-Term Reduction and Diel Fluctuation in Dissolved Oxygen on Spawning of Black Crappie, Pomoxis Nigromaculatus,
W79-01440 5C

SEASONAL GROWTH (PLANTS)
Seasonal Growth and Decomposition of Vallisneria americana in the Pamlico River Estuary,
W79-01362 5C

SEAWEEDS
Polyhalogenated 1-Octene-3-Ones, Antibacterial Metabolites from the Red Seaweed Bonnemaisonia Asparagoides,
W79-01204 5C

SECONDARY EFFLUENT EFFECTS
A Bioassay Technique to Evaluate the Effect of Secondary Effluent on Algal Interactions in the Connecticut River,
W79-01089 5C

SEDIMENT CONTROL
Soil Erosion Control Policies - Institutional Alternatives and Costs,
W79-01164 5G

SEDIMENT ORGANIC WEIGHT
The Effect of Several Physical and Chemical Factors Upon the Distribution of Benthic Macroinvertebrates in Dunham Pond, Connecticut,
W79-01330 5C

SEDIMENT PARTICLE SIZE
The Effect of Several Physical and Chemical Factors Upon the Distribution of Benthic Macroinvertebrates in Dunham Pond, Connecticut,
W79-01330 5C

SEDIMENT TRANSPORT
Field Study of Sediment Transport Characteristics of the Mississippi River near Fox Island (RM 355-6) and Buzzard Island (RM 349-50),
W79-01065 2J

SEDIMENT-WATER INTERFACES
Distribution of Autotrophic Nitrifying Bacteria in a Polluted River (the Passaic),
W79-01007 5B

Water Resources and the Land-Water Interface,
W79-01295 6E

A Chemical Budget of a Soft-Water Bog Lake: Benthic Contributions,
W79-01423 2H

SEDIMENTARY ROCKS
Characteristics of Arizona Ponderosa Pine Stands on Sandstone Soils,
W79-01099 2I

SEDIMENTATION
Field Study of Sediment Transport Characteristics of the Mississippi River near Fox Island (RM 355-6) and Buzzard Island (RM 349-50),
W79-01065 2J

Sedimentation and Microbial Metabolism in a Shallow Estuary,
W79-01091 2J

The Case of the Shrinking Channels-The North Platte and Platte Rivers in Nebraska,
W79-01380 4A

Pollution Abatement Facilities at National Fish Hatcheries,
W79-01463 5G

SEDIMENTATION CONTROL
Guidelines for Mandatory Erosion Control Programs,
W79-01160 5G

SEDIMENTS
Transformations of Heavy Metals and Plant Nutrients in Dredged Sediments as Affected by Oxidation Reduction Potential and pH, Volume II: Materials and Methods/Results and Discussion,
W79-01201 5C

Geochemistry of Mercury in Palos Verdes Sediments,
W79-01250 5B

Metals from Urban Runoff in Dated Sediments of a Very Shallow Estuary,
W79-01251 5A

Accumulation of Arsenic in Sediments of Lakes Treated with Sodium Arsenite,
W79-01253 5B

Influence of Sediment in Copper Toxicity Tests with the Polychaete Neanthes Arenaceodentata,
W79-01460 5A

An Economic Evaluation of Cropland Use as a Control for Sediment Nonpoint Pollution,
W79-01498 5G

SEEPAGE
Evaluation of the Impact of the Mines Development, Incorporated Mill on Water Quality Conditions in the Cheyenne River.
W79-01209 5B

SELENASTRUM CAPRICORNUTUM
Use of Unicellular Algae for Evaluation of Potential Aquatic Contaminants,
W79-01476 5A

SEMI-PERMEABLE MEMBRANES
Purification of Water by Reverse Osmosis Using a Supported Semi-Permeable Membrane,
W79-01414 5F

SEMIPERMEABLE MEMBRANES
Treatment of Wastewaters Generated in Electroplating Shops by Reverse Osmosis. (1. Concentration of Washing Waters from Nickel-Plating Processes) (Ochistka stokov gal'vanotsekhov metodom obratnogo osmosa (1. kontsentrirovanie promyvnkh vod nikelirovaniya),
W79-01077 5D

Specification of Cellulose Acetate to be Used in Semipermeable Membranes,
W79-01129 3A

SENSITIVE TETRAZOLIUM
Sedimentation and Microbial Metabolism in a Shallow Estuary,
W79-01091 2J

SEPARATION TECHNIQUES
Preparation of Copper Precipitate for Electrolytic Copper Recovery from Electroplating Industry Wastewater (Denki mekki kojo haisui kara no do no denkai kaishu o mokteki to shita do chinden no seisei hoho),
W79-01076 5D

Fixed-Bed Electrolysis - A Process for Purifying Waste Water Contaminated with Metals (Festbettelektrolyse - ein Verfahren zur Reinigung metallhaltiger Abwasser),
W79-01081 5D

Removal and Separation of Spilled Hazardous Materials from Impoundment Bottoms,
W79-01307 5G

Multiple Effect Evaporation of Water from Water Containing Combustible Sludges,
W79-01398 5E

SEPTIC TANKS
Septic Tank-Leaching Pool Arrangement,
W79-01399 5D

SERIOLA
On the Pharmacological Effects of Diisopropylnaphthalene on Yellow-Tail (In Japanese),
W79-01450 5C

SETTLING BASINS
Heavy Metal Accumulation and its Effect on the Biota of an Industrial Settling Pond,
W79-01124 5D

SEWAGE DISPOSAL
Bond Street and Weatherbest Slip Boathouse Owners V. City of North Tonawanda (City may not Terminate Water Service to a Customer in Good Standing).
W79-01187 6E

SEWAGE EFFLUENTS
Biological Control Agents of Sewage Bacteria in Marine Habitats,
W79-01027 5C

Characteristics of Small Mammal Populations in Forested and Old Field Habitats Prior to Effluent Spray Irrigation,
W79-01331 5C

SEWAGE SLUDGE
Growth and Cadmium Accumulation of Plants Grown on a Soil Treated with a Cadmium-Enriched Sewage Sludge,
W79-01282 5C

Carbon and Nitrogen Transformations in Soils Amended with Sewage Sludge,
W79-01350 5C

SEWAGE TREATMENT
A Study for Improving the Aerobic-Media Trickling Filter for Wastewater Treatment,
W79-01123 5D

Fresh-Water Weeds are a Resource,
W79-01197 5C

Sensitivity Analysis of a Phosphorus Removal Strategy Computer Model,
W79-01310 5D

Differential Bed Kinetic Analysis of Heavy Metal Removals by Biological Slimes,
W79-01314 5D

Septic Tank-Leaching Pool Arrangement,
W79-01399 5D

Method of Treatment of an Oxidizable Material by a Biochemical Process,
W79-01412 5D

Apparatus for Use in Water Purification Particularly Sewage Treatments,
W79-01418 5D

SEWAGE TREATMENT PLANT
Dissolved Organic Carbon Fluxes in the Shetucket River of Eastern Connecticut, USA,
W79-01337 5C

SEWER EFFLUENT CHARGES
The Response of Firms to Pollution Charges,
W79-01499 5G

SHALES
Fluid Development for Drilling Sloughing and Heaving Shales,
W79-01104 8G

Salt Pickup by Overland Flow in the Price River Basin, Utah,
W79-01245 5B

SHALLOW WATER EQUATIONS
Analytic Solutions for Computer Flow Model Testing,
W79-01256 2L

SHELL THICKNESS (SNAILS)
Shell Structure of Immature Roman Snails (Helix Pomatia) After Exposure to P,P'-DDT,
W79-01020 5C

SHETUCKET RIVER (CONN)
Dissolved Organic Carbon Fluxes in the Shetucket River of Eastern Connecticut, USA,
W79-01337 5C

SHORE BIRDS
Great Blue Herons Respond to Nesting Habitat Loss,
W79-01432 6G

SHORES
City of Berkely V. Superior Court for the County of Alameda (Additional Adjudication Issues Need to Determine if Land Subject to Public 'Tideland Trust'),
W79-01189 6E

Role of Turbulent Mixing in the Dispersion of Pollutants at the Edge of a Large Lake,
W79-01199 5C

SHRIMP
Effects of Kelthane and Temperature on the Respiration of Crangon Franciscorum,
W79-01241 5C

Effects of Industrial Wastewater Effluents on Water Quality in Gibson Cove and Kodiak Harbor, Kodiak, Alaska, August 26-29, 1974.
W79-01437 5C

The Influence of Temperature and Salinity on the Toxicity of Hexavalent Chromium to the Grass Shrimp Palaemonetes Pugio (Holthuis),
W79-01457 5C

SIERRA MOUNTAINS (CALIF)
A Societal Assessment of the Proposed Sierra Snowpack Augmentation Project,
W79-01063 3B

SIEVES
Hydrogen Recovery from Purge Gas of Ammonia Plants,
W79-01067 5D

SILICA
A Chemical Budget of a Soft-Water Bog Lake: Benthic Contributions,
W79-01423 2H

SILTING
Oak Leaf Country Club, Inc. v. Wilson (Flood Damage Caused by Channelization),
W79-01182 6E

SILVER
The Availability of Sediment-Bound Cobalt, Silver, and Zinc to a Deposit-Feeding Clam,
W79-01468 5B

SILVERSIDES
Abundance, Diversity, and Stability in Shore-Zone Fish Communities in an Area of Long Island Sound Affected by the Thermal Discharge of a Nuclear Power Station,
W79-01021 5C

SIMULATION ANALYSIS
Modeling Pesticides and Nutrients on Agricultural Lands,
W79-01004 5B

Role of Turbulent Mixing in the Dispersion of Pollutants at the Edge of a Large Lake,
W79-01199 5C

SIMULIUM
Uptake of Zinc by the Aquatic Larvae of Simulium Ornatipes (Diptera: Newatocera),
W79-01026 5C

SINKS
The Availability of Sediment-Bound Cobalt, Silver, and Zinc to a Deposit-Feeding Clam,
W79-01468 5B

SIX MILE RUN RESERVOIR (NJ)
The Effects of Land Use on Phosphorus Loading: A Case Study - Six Mile Run Reservoir,
W79-01086 5C

SLUDGE
Cadmium Availability to Rice in Sludge-Amended Soil Under 'Flood' and 'Nonflood' Culture,
W79-01127 5E

SLUDGE DIGESTION
Nitrogen and Phosphorus Behavior During Aerobic Digestion of Waste Activated Sludge,
W79-01003 5D

SLUDGE DISPOSAL
Multiple Effect Evaporation of Water from Water Containing Combustible Sludges,
W79-01398 5E

SLUDGE DISPOSAL
Cadmium Availability to Rice in Sludge-Amended Soil Under 'Flood' and 'Nonflood' Culture,
W79-01127 5E

Growth and Cadmium Accumulation of Plants Grown on a Soil Treated with a Cadmium-Enriched Sewage Sludge,
W79-01282 5C

Economic Analysis of Alternative Sludge Disposal Methods in Vermont,
W79-01328 5E

SLUDGE TREATMENT
Water Content Reduction of Metal-Plating Waste Sludge by a Press and Centrifuge (Mekki suraji no kokaiteki dassui ni kansuru kisoteki kenkyu),
W79-01082 5E

Yield and Cadmium Accumulation of Forage Species in Relation to Cadmium Content of Sludge-Amended Soil,
W79-01237 5C

The Dewatering of Lime-Algae Sludge on Sand Drying Beds,
W79-01349 5D

Multiple Effect Evaporation of Water from Water Containing Combustible Sludges,
W79-01398 5E

SMALL ANIMALS (MAMMALS)
Stream Channelization Impacts on Songbirds and Small Mammals in Vermont,
W79-01431 6G

SMALL-DIAMETER PUMP
Gas-Driven Pump for Ground-Water Supplies,
W79-01378 8C

SMALL SCALE TURBULENCE
Some Observed Statistical Properties of Small Scale Turbulence,
W79-01055 2L

SNAIL DARTER
The Tennessee Valley Authority's Tellico Dam Project-Costs, Alternatives, and Benefits.
W79-01193 6B

SNAILS
Shell Structure of Immature Roman Snails (Helix Pomatia) After Exposure to P,P'-DDT,
W79-01020 5C

Growth and Mortality of Littorina Irrorata Say in Three North Carolina Marshes,
W79-01289 2L

SNAKE RIVER (IDA)
Analysis of Water Flow Problems in the Hells Canyon of the Snake River,
W79-01359 4A

SNAKE RIVER (IDAHO)
Flood Plain Inundation Caused by Dam Failure,
W79-01265 8B

Calculating and Routing the Teton Dam-Break Flood,
W79-01271 8B

SNAKE RIVER PLAIN (IDAHO)
Water Resources of the Upper Henrys Fork Basin in Eastern Idaho.
W79-01364 6D

SNOW
Acoustic Doppler Sounding of Falling Snow,
W79-01034 2C

SNOWFALL
Randomized Cloud Seeding in the San Juan Mountains, Colorado,
W79-01035 3B

A Societal Assessment of the Proposed Sierra Snowpack Augmentation Project,
W79-01063 3B

SOCIAL IMPACT
A Societal Assessment of the Proposed Sierra Snowpack Augmentation Project,
W79-01063 3B

SOCKEYE SALMON
Acute Toxicity at Three Primary Sewage Treatment Plants,
W79-01436 5C

SODA LAKES
The Toxic Effect of Copper on Algae and Rotifers from a Soda Lake (Lake Nakuru, East Africa),
W79-01459 5C

SODIUM ARSENITE
Accumulation of Arsenic in Sediments of Lakes Treated with Sodium Arsenite,
W79-01253 5B

SODIUM COMPOUNDS
Effluent Treatment Plant Cleans up Down the Valleys,
W79-01078 5D

Oxidation of Lyes and Treatment of Wastewater with Gaseous Oxygen (Okispenie shchelokov i obrabotka stochnykh vod gazoobraznym kislorodom),
W79-01083 5D

SOFT-WATER BOG LAKE
A Chemical Budget of a Soft-Water Bog Lake: Benthic Contributions,
W79-01423 2H

SOFT-WATER LAKE
The Effect of Several Physical and Chemical Factors Upon the Distribution of Benthic Macroinvertebrates in Dunham Pond, Connecticut,
W79-01330 5C

SOIL ALGAE
Primary Production of Edaphic Algal Communities in a Delaware Salt Marsh,
W79-01296 5C

SOIL AMENDMENTS
Carbon and Nitrogen Transformations in Soils Amended with Sewage Sludge,
W79-01350 5C

SOIL BACTERIA
Nitrogen Accretion, and the Nature and Possible Significance of N2 Fixation (Acetylene Reduction) in a Nova Scotian Spartina Alterniflora Stand,
W79-01214 5C

Micro-Inhabitants of Marsh Peat Soils in the Tomsk Region,
W79-01299 2H

Role of Excrement of Invertebrates in the Activation of Microflora of Marsh Peat Soils,
W79-01303 2G

SOIL CONSERVATION
Pre-Management Assessment of Aquatic Macroinvertebrates in a Small, Sedimentary Drainage Area of the Maumee and Lake Erie Basin.
W79-01096 5C

SOIL CONTAMINATION EFFECTS
Yield and Cadmium Accumulation of Forage Species in Relation to Cadmium Content of Sludge-Amended Soil,
W79-01237 5C

SOIL EROSION
Simulation of Soil Erosion in the Palouse Praine of the Pacific Northwest,
W79-01087 4D

Effect of Mulching on Sediment in Runoff from Simulated Rainfall,
W79-01130 4D

Evaluation of Wild Oat Straw as a Soil Erosion Retardant Using Simulated Rainfall,
W79-01131 4D

SOIL FORMATION
Interrelation Between Insect Larvae and Soil Microflora in Forest Bogs,
W79-01301 2G

SOIL FUNGI
Micro-Inhabitants of Marsh Peat Soils in the Tomsk Region,
W79-01299 2H

SOIL GASES
Seasonal Variation in Pco2 and C-13 Content of Soil Atmosphere,
W79-01387 2F

SOIL STRENGTH
A Probabilistic Analysis of Embankment Stability Problems,
W79-01054 8D

SOIL WATER
Remote Sensing of Water Levels in Small-Diameter Wells,
W79-01101 7B

SOIL WATER MOVEMENT
Relation of Water Absorption to Duration of Application in Furrow Irrigation,
W79-01094 3F

SOIL-WATER-PLANT RELATIONSHIPS
Growth and Resource Allocation Responses of Spartina Alterniflora Loisel to Three Levels of NH sub 4-N, FE, and NACL in Solution Culture,
W79-01294 2I

SOILS
Relation of Water Absorption to Duration of Application in Furrow Irrigation,
W79-01094 3F

SOLAR DISTILLATION
Solar-Assisted Distillation of Sea Water,
W79-01239 3A

SOLAR STILLS
Solar-Assisted Still with Vapor-Compression Option,
W79-01126 3A

SOLID WASTES
Automated Treatment and Recycle of Swine Feedlot Wastewaters,
W79-01316 5D

SOUND WAVES
Acoustic Doppler Sounding of Falling Snow,
W79-01034 2C

SOUTH CAROLINA
Additions to the Freshwater Algae of South Carolina,
W79-01203 5C

Thermal Alterations of Aquatic Ecosystems,
W79-01284 5C

Transplantation of Salt Marsh Vegetation. II. Georgetown, South Carolina,
W79-01306 2L

SOUTHERN FLORIDA
Water Resources Data for Florida, Water Year 1977--Volume 2A: Southern Florida, Surface Water.
W79-01370 7C

Water Resources Data for Florida, Water Year 1977--Volume 2B: Southern Florida, Ground Water.
W79-01371 7C

SOUTHWEST U.S.
Conference Proceedings - A Critical Economic Balance, Water - Land - Energy - People - Held at Colorado State University, Pingree Park Campus on June 6-7, 1977,
W79-01478 6B

SPARTINA-ALTERNIFLORA
Fatty Acid Composition of Organic Detritus from Spartina Alterniflora,
W79-01332 5C

SPAWNING
Effect of Long-Term Reduction and Diel Fluctuation in Dissolved Oxygen on Spawning of Black Crappie, Pomoxis Nigromaculatus,
W79-01440 5C

SPECIES DIVERSITY
Abundance, Diversity, and Stability in Shore-Zone Fish Communities in an Area of Long Island Sound Affected by the Thermal Discharge of a Nuclear Power Station,
W79-01021 5C

Changes in Submerged Aquatic Macrophyte Populations at the Head of Chesapeake Bay, 1958-1975,
W79-01030 5C

Stream Channelization Impacts on Songbirds and Small Mammals in Vermont,
W79-01431 6G

SPECIFIC CONDUCTIVITY
An Automated Procedure for the Simultaneous Determination of Specific Conductance and pH in Natural Water Samples,
W79-01374 2K

SPECIFICATIONS
Gas-Driven Pump for Ground-Water Supplies,
W79-01378 8C

SPHAGNUM-RED MAPLE BOG
The Effect of Several Physical and Chemical Factors Upon the Distribution of Benthic Macroinvertebrates in Dunham Pond, Connecticut,
W79-01330 5C

SPIRODELLA
Effects of Chromium on Some Aquatic Plants,
W79-01031 5C

SPIRULINA
The Toxic Effect of Copper on Algae and Rotifers from a Soda Lake (Lake Nakuru, East Africa),
W79-01459 5C

SPORT FISHING
Economic Value of Hunting, Fishing, and General Rural Outdoor Recreation,
W79-01430 6B

SPRINKLER IRRIGATION
Adjustable Height Sprinkler,
W79-01411 3F

STABILIZATION
Fluid Development for Drilling Sloughing and Heaving Shales,
W79-01104 8G

STABLE ISOTOPES
Seasonal Variation in Pco2 and C-13 Content of Soil Atmosphere,
W79-01387 2F

STANDARDS
Equitable Recovery of Industrial Waste Treatment Costs in Municipal Systems, Federal Guidelines.
W79-01206 5D

A Note on the Use of Taxes to Control Pollution,
W79-01496 5G

The 'Standards and Price' Approach to Pollution Control: Problems of Iteration,
W79-01497 5G

STANDING CROP
Relationships Between Mineral Supply and Growth of Narthecium Ossifragum (L.) Huds. on Mire Ecosystems,
W79-01216 2H

STANDING CROPS
Quantitative and Qualitative Changes in the Phytoplankton of Lake Kinneret, Israel, 1972-1975,
W79-01198 5C

Standing Crops of Marsh Vegetation of Two Tributaries of Chesapeake Bay,
W79-01433 2L

STAPHYLOCOCCUS AURESUS
Polyhalogenated 1-Octene-3-Ones, Antibacterial Metabolites from the Red Seaweed Bonnemaisonia Asparagoides,
W79-01204 5C

STATE JURISDICTION
Coastal Planning: The Designation and Management of Areas of Critical Environmental Concern,
W79-01152 5G

STATISTICAL MODELS
Stochastic Modeling of Monthly and Daily Rainfall Sequences,
W79-01244 2B

STEADY-STATE MODEL
A Chemical Budget of a Soft-Water Bog Lake: Benthic Contributions,
W79-01423 2H

STEMFLOW
Nutrient Fluxes in Precipitation, Throughfall, and Stemflow in an Oak-Hickory Forest,
W79-01246 2I

STOCHASTIC PROCESSES
Stochastic Modeling of Monthly and Daily Rainfall Sequences,
W79-01244 2B

STOCHASTIC STRUCTURE
Generation of Daily Precipitation Over an Area,
W79-01261 2B

STORAGE CAPACITY
Regional Ground-Water Management,
W79-01105 4B

STRATIFICATION
Mixing and Dispersion in Estuaries,
W79-01338 5B

STREAMFLOW
Low-Flow Characteristics of Streams in the Rock-Fox River Basin, Wisconsin,
W79-01366 2E

Runoff from Hydrologic Units in Florida,
W79-01368 7C

The Case of the Shrinking Channels-The North Platte and Platte Rivers in Nebraska,
W79-01380 4A

STREAMS
Geomorphologic Characteristics of Fourteen Indiana Watersheds Obtained from a Computer Data Bank of Stream Networks,
W79-01426 4D

Stream Channelization Impacts on Songbirds and Small Mammals in Vermont,
W79-01431 6G

STREAMSIDE HABITATS
Stream Channelization Impacts on Songbirds and Small Mammals in Vermont,
W79-01431 6G

STRIP MINES
Feasibility Study, Fly Ash Reclamation of Surface Mines, Hillman State Park, Feasibility Study,
W79-01323 5G

The Industry's Role in Energy Management,
W79-01484 6B

STRIPED BASS
Chlorine effects on Larval Development of Striped Bass (Morone Saxatilis), White Perch (M. Americana) and Blueback Herring (Alosa Aestivalis),
W79-01456 5C

SUBLETHAL EFFECTS
Shell Structure of Immature Roman Snails (Helix Pomatia) After Exposure to P,P'-DDT,
W79-01020 5C

The Toxic Effects of the Water Soluble Fractions of No. 2 Fuel Oil and Three Aromatic Hydrocarbons on the Behavior and Survival of Barnacle Larvae,
W79-01025 5C

SUBMERGED PLANTS
Changes in Submerged Aquatic Macrophyte Populations at the Head of Chesapeake Bay, 1958-1975,
W79-01030 5C

Nitrogen and Phosphorus Fertilization of Aquatic Vascular Plants and Algae in Replicated Ponds. I. Initial Response to Fertilization,
W79-01224 5C

SUBSTRATES
The Behavior of Juvenile Atlantic Salmon (Salmo Salar) and Brook Trout (Salvelinus Fontinalis) with Regard to Temperature and to Water Velocity,
W79-01441 5C

SUBSURFACE DRAINAGE
Evaluation of Design Methods of Subsurface Drainage Facilities for Highways,
W79-01061 4C

SUBSURFACE WATERS
Underground Injection Program Set Under Safe Drinking Water Act,
W79-01154 5G

SUCCESSION
Biological Control Agents of Sewage Bacteria in Marine Habitats,
W79-01027 5C

SUCCESSION

Changes in Submerged Aquatic Macrophyte Populations at the Head of Chesapeake Bay, 1958-1975,
W79-01030 5C

Quantitative and Qualitative Changes in the Phytoplankton of Lake Kinneret, Israel, 1972-1975,
W79-01198 5C

An Ecological Study of a Baldcypress Swamp in St. Charles Parish, Louisiana,
W79-01226 2L

SUDAN
Aquatic Weed Management: Some Prospects for the Sudan and the Nile Basin, Report of a Workshop Held at Khartoum, Sudan on 24-29 November 1975.
W79-01205 5G

SUGAR CORPS
Wastewater Treatment in the Sugar Industry (II) (Abwasseraufbereitung der Zuckerwarenindustrie (II)).
W79-01072 5D

SUGAR CROPS
Determination of the Bichromate Oxidizability of Sugar Factory Effluents (Opredelenie bikhromatnoy okislyaemosti stochnykh vod sakharnogo zavoda),
W79-01074 5A

SULFATES
Parameterization of Sulfate Removal by Precipitation,
W79-01038 5B

Sewage from the Yeast Industry: Its Nature and Its Purification (Abwasser der Hefeindustrie, Beschaffenheit und Reinigung),
W79-01075 5D

Treatment of Wastewaters Generated in Electroplating Shops by Reverse Osmosis. (1. Concentration of Washing Waters from Nickel-Plating Processes) (Ochistka stokov gal'vanotsekhov metodom obratnogo osmosa (1. kontsentrirovanie promyvnkh vod nikelirovaniya),
W79-01077 5D

Investigations of the Decoloration of Wastewaters Generated in Confier Sulfate Pulp Mills (Cercetari privind decolorarea apelor reziduale provenite de la fabricarea celulozei sulfat din rasinoase),
W79-01084 5D

SULFIDES
Oxidation of Lyes and Treatment of Wastewater with Gaseous Oxygen (Okispenie shchelokov i obrabotka stochnykh vod gazoobraznym kislorodom),
W79-01083 5D

SUNFISHES
Nitrogen Fertilization of Ponds,
W79-01439 5C

Effect of Long-Term Reduction and Diel Fluctuation in Dissolved Oxygen on Spawning of Black Crappie, Pomoxis Nigromaculatus,
W79-01440 5C

A Biological Assessment of Fish and Benthic Populations Inhabiting a Kraft Mill Effluent Channel,
W79-01448 5C

SURF DIATOMS
Persistent Blooms of Surf Diatoms Along the Northwest Coast,
W79-01200 5C

SURFACE FILMS
Drift Velocity of Surface Films Over Waves,
W79-01139 5B

SURFACE-GROUNDWATER RELATIONSHIPS
Digital-Model Simulation of the Glacial-Outwash Aquifer, Otter Creek-Dry Creek Basin, Cortland County, New York,
W79-01377 2F

SURFACE WATERS
Nitrate and Nitrite in the Surface Waters of Two Delaware Salt Marshes,
W79-01291 5B

Water Resources of the Upper Henrys Fork Basin in Eastern Idaho.
W79-01364 6D

Water Resources Data for Florida, Water Year 1977--Volume 2A: Southern Florida, Surface Water.
W79-01370 7C

Water Resources Data for New Hampshire and Vermont, Water Year 1977.
W79-01372 7C

Water Resources Data for Florida, Water Year 1977--Volume 1: Northeast Florida.
W79-01373 7C

Program for Monitoring Surface-Water Quality in Florida,
W79-01376 7C

Water-Resources Investigations of the U.S. Geological Survey in Montana, October 1977 Through September 1978.
W79-01379 7C

Dissolved-Solids Concentrations and Loads in Florida Surface Waters,
W79-01382 7C

Chloro-Organics in Surface Water Sources for Potable Water,
W79-01472 5B

SURFACTANTS
Quantitative Determination of Quaternary Ammonium Bases (QAB) in Water and Wastewater by Thin Layer Chromatography,
W79-01070 5A

Renovation of Industrial Inorganic Wastewater by Evaporation with Interface Enhancement,
W79-01319 5D

SURVEYS
A Societal Assessment of the Proposed Sierra Snowpack Augmentation Project,
W79-01063 3B

State-of-the-Art: Military Explosives and Propellants Production Industry, Vol. III -- Wastewater Treatment,
W79-01318 5D

SURVIVAL
Effect of Long-Term Reduction and Diel Fluctuation in Dissolved Oxygen on Spawning of Black Crappie, Pomoxis Nigromaculatus,
W79-01440 5C

SUSPENDED SEDIMENT
Characteristics of Arizona Ponderosa Pine Stands on Sandstone Soils,
W79-01099 2I

SUSPENDED SOLIDS
Characteristics of Arizona Ponderosa Pine Stands on Sandstone Soils,
W79-01099 2I

SUSPENSION CULTURE
The Feasibility of Suspension Culture of Oysters (Crassostrea Virginica) at a Petroleum Platform off the Texas Coast,
W79-01024 5C

SUSQUEHANNA FLATS (MARYLAND)
Changes in Submerged Aquatic Macrophyte Populations at the Head of Chesapeake Bay, 1958-1975,
W79-01030 5C

SUSQUEHANNA RIVER (PENN)
Effects of Chromium on Some Aquatic Plants,
W79-01031 5C

SUTLEJ CATCHMENT (INDIA)
Estimation of Water Balance of Lower Sutlej Catchment Up to Bhakra Dam Site by Thornthwaite's Method,
W79-01257 4A

SWAMPS
The Okefenokee Swamp Watershed: Water Balance and Nutrient Budgets,
W79-01211 2H

An Ecological Study of a Baldcypress Swamp in St. Charles Parish, Louisiana,
W79-01226 2L

The Effect of Fire on Species Composition in Cypress Dome Ecosystems,
W79-01292 4C

SYSTEMS ECOLOGY
Inland Wetland Definitions,
W79-01335 6E

TAMARISK
An Energy Budget Analysis of Evapotranspiration from Saltcedar,
W79-01231 3B

TELEOST FISH
Effect of Mercuric Chloride on the Digestive System of a Teleost Fish, Channa Punctatus,
W79-01019 5C

TELLICO DAM (TN)
The Tennessee Valley Authority's Tellico Dam Project-Costs, Alternatives, and Benefits.
W79-01193 6B

TEMPERATURE
The Density of Seawater Solutions at One Atmosphere as a Function of Temperature and Salinity,
W79-01064 2K

The Effect of Dirunal Variation in Light and Temperature on the Acetylene Reduction Activity (N2 Fixation) of Subterranean Clover,
W79-01092 2I

Effects of Kelthane and Temperature on the Respiration of Crangon Franciscorum,
W79-01241 5C

Suspension-Feeding Aquaculture Systems: Effects of Phytoplankton Concentration and Temperature on Growth of the Bay Scallop,
W79-01285 5C

Seasonal Growth and Decomposition of Vallisneria americana in the Pamlico River Estuary,
W79-01362 5C

TENNESSEE VALLEY AUTHORITY
The Tennessee Valley Authority's Tellico Dam Project-Costs, Alternatives, and Benefits.
W79-01193 6B

TERTIARY TREATMENT
Observations on Algal Populations and Experimental Maturation Pond System,
W79-01196 5D

Fresh-Water Weeds are a Resource,
W79-01197 5C

TETON DAM
A Numerical Model for Multidimensional Unconstrained Flow Over Irregular Terrain,
W79-01275 8B

TETON DAM (IDAHO)
Flood Plain Inundation Caused by Dam Failure,
W79-01265 8B

A Simulation of the Hydraulic Events During and Following the Teton Dam Failure,
W79-01269 8B

The Development and Testing of a Dam-Break Flood Forecasting Model,
W79-01270 8B

Calculating and Routing the Teton Dam-Break Flood,
W79-01271 8B

TETON DAM (MONT)
Floods from Breaching of Dams,
W79-01267 8B

TEXAS
Bed Forms and Stratification Types of Modern Gravel Meander Lobes, Nueces River, Texas,
W79-01044 2J

Riparian Rights Under the Texas Water Rights Adjudication Act - A Constitution Analysis,
W79-01140 6E

THAILAND
Stochastic Modeling of Monthly and Daily Rainfall Sequences,
W79-01244 2B

THEORETICAL ANALYSIS
Some Observed Statistical Properties of Small Scale Turbulence,
W79-01055 2L

THERMAL ENERGY
Legal and Institutional Planning for Macro-Conservation Measures,
W79-01227 6E

Energy Conservation: Is the Heat Storage Well the Key.,
W79-01228 4B

Heat Storage Wells Conserve Fuels,
W79-01230 4B

THERMAL ENERGY STORAGE
Energy Conservation: Is the Heat Storage Well the Key.,
W79-01228 4B

Heat Storage Wells Conserve Fuels,
W79-01230 4B

THERMAL FOG DISPERSAL
Heat and Thrust Requirements of a Thermal Fog Dispersal System,
W79-01058 3B

THERMAL POLLUTION
Abundance, Diversity, and Stability in Shore-Zone Fish Communities in an Area of Long Island Sound Affected by the Thermal Discharge of a Nuclear Power Station,
W79-01021 5C

Thermal Alterations of Aquatic Ecosystems,
W79-01284 5C

THERMAL POWERPLANTS
Scaling and Corrosion in an Experimental Geothermal Power Plants,
W79-01106 3C

The Expanding Geysers,
W79-01116 4B

Thermal Discharges and Power Plant Intakes: Section 316 in Perspective,
W79-01159 5G

Legal and Institutional Planning for Macro-Conservation Measures,
W79-01227 6E

Cycling of Elements in Duckweed (Lemna Perpusilla) in an Ash Settling Basin and Swamp Drainage System,
W79-01458 5C

THERMAL SHOCK
Effect of Thermal Shock on Predator Avoidance by Larvae of Two Fish Species,
W79-01454 5C

THERMAL WATER
Thermal Discharges and Power Plant Intakes: Section 316 in Perspective,
W79-01159 5G

Energy Conservation: Is the Heat Storage Well the Key.,
W79-01228 4B

Heat Storage Wells Conserve Fuels,
W79-01230 4B

Investigation of Heat Transfer Coefficients of Working Fluids in Geothermal Power Cycles,
W79-01279 4B

THOMAS-FIERING MODEL
Stochastic Modeling of Monthly and Daily Rainfall Sequences,
W79-01244 2B

THORNTHWAITE METHOD
Estimation of Water Balance of Lower Sutlej Catchment Up to Bhakra Dam Site by Thornthwaite's Method,
W79-01257 4A

THROUGHFALL
Nutrient Fluxes in Precipitation, Throughfall, and Stemflow in an Oak-Hickory Forest,
W79-01246 2I

TIDAL EFFECTS
Analytic Solutions for Computer Flow Model Testing,
W79-01256 2L

The Ecotone Between Spartina Foliosa Trin. and Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay: III. Soil Aeration and Tidal Immersion,
W79-01283 2L

TIN
Effluent Treatment Plant Cleans up Down the Valleys,
W79-01078 5D

TISSUE ANALYSIS
Effect of Mercuric Chloride on the Digestive System of a Teleost Fish, Channa Punctatus,
W79-01019 5C

Chlorinated Hydrocarbons and Mercury in Aquatic Vascular Plants of Lake Paijanne, Finland,
W79-01029 5C

Influence of Temperature on Growth Promotion and Body Composition of Carp (Cyprinus Carpio) Due to Bovine Growth Hormone,
W79-01438 5C

Effect of Long-Term Reduction and Diel Fluctuation in Dissolved Oxygen on Spawning of Black Crappie, Pomoxis Nigromaculatus,
W79-01440 5C

On the Pharmacological Effects of Diisopropylnaphthalene on Yellow-Tail (In Japanese),
W79-01450 5C

Importance of Algae in the Diet of the Oligochetes Lumbriculus Variegatus (Muller) and Rhyacodrilus Sodalis (Eisten),
W79-01453 5C

Cycling of Elements in Duckweed (Lemna Perpusilla) in an Ash Settling Basin and Swamp Drainage System,
W79-01458 5C

Influence of Sediment in Copper Toxicity Tests with the Polychaete Neanthes Arenaceodentata,
W79-01460 5A

Experimental Study on the Concentration Process of Trace Element Through a Food Chain from the Viewpoint of Nutrition Ecology,
W79-01461 5B

The Availability of Sediment-Bound Cobalt, Silver, and Zinc to a Deposit-Feeding Clam,
W79-01468 5B

TOLUENE
The Toxic Effects of the Water Soluble Fractions of No. 2 Fuel Oil and Three Aromatic Hydrocarbons on the Behavior and Survival of Barnacle Larvae,
W79-01025 5C

TOXICITY
Toxicity and Mutagenicity of 2,4,6-Trinitrotoluene and Its Microbial Metabolites,
W79-01012 5C

Effect of DDT and Polychlorinated Biphenyls on Cell Population Growth of Crithidia Fasciculata, A Flagellated Protozoan,
W79-01013 5C

Bioassays on Marine Organisms: Acute Toxicity Test of Mercury, Cadmium, and Copper to Arkshell, Anadara Broughtonii, from Jin-Dong Bay, and to Oyster, Crassostrea Gigas, from Kwangdo Bay, South Coast of Korea,
W79-01015 5C

Effect of Mercuric Chloride on the Digestive System of a Teleost Fish, Channa Punctatus,
W79-01019 5C

The Toxic Effects of the Water Soluble Fractions of No. 2 Fuel Oil and Three Aromatic Hydrocarbons on the Behavior and Survival of Barnacle Larvae,
W79-01025 5C

Uptake of Zinc by the Aquatic Larvae of Simulium Ornatipes (Diptera: Newatocera),
W79-01026 5C

Effects of Chromium on Some Aquatic Plants,
W79-01031 5C

Injurious Effect of Tap Water on Rooting of Cuttings of Bryophyllum Calycinum,
W79-01221 5C

Acute Toxicity at Three Primary Sewage Treatment Plants,
W79-01436 5C

Effect of Complexation by Natural Organic Ligands on the Toxicity of Copper to a Unicellular Alga, Monochrysis Lutheri,
W79-01449 5C

On the Pharmacological Effects of Diisopropylnaphthalene on Yellow-Tail (In Japanese),
W79-01450 5C

Chlorine effects on Larval Development of Striped Bass (Morone Saxatilis), White Perch (M. Americana) and Blueback Herring (Alosa Aestivalis),
W79-01456 5C

The Influence of Temperature and Salinity on the Toxicity of Hexavalent Chromium to the Grass Shrimp Palaemonetes Pugio (Holthuis),
W79-01457 5C

The Toxic Effect of Copper on Algae and Rotifers from a Soda Lake (Lake Nakuru, East Africa),
W79-01459 5C

Influence of Sediment in Copper Toxicity Tests with the Polychaete Neanthes Arenaceodentata,
W79-01460 5A

Use of Unicellular Algae for Evaluation of Potential Aquatic Contaminants,
W79-01476 5A

TOXINS
The Toxic Effects of the Water Soluble Fractions of No. 2 Fuel Oil and Three Aromatic Hydrocarbons on the Behavior and Survival of Barnacle Larvae,
W79-01025 5C

Water Contamination by Toxic Pollutants: An Assessment of Regulation,
W79-01174 6E

TRACE ELEMENTS
Trace Metal Enhancement in the Biotic and Abiotic Components of an Estuarine Tidal Front,
W79-01046 5B

TRACE METALS
Evaluation of Micromolar Complexiometric Titrations for the Determination of the Complexing Capacity of Natural Waters,
W79-01344 5A

Determination of the Complexing Capacity of Natural Water by Cobalt (III) Complexation,
W79-01345 5A

TRACERS
Trichlorofluoromethane, a New Hydrologic Tool for Tracing and Dating Ground Water,
W79-01422 2F

TRANSMISSIVITY
Transmissivity and Hydraulic Conductivity of Saturated Sedimentary Rocks in the Hanford Reservation,
W79-01053 8B

TRANSPLANTATION
Transplantation of Salt Marsh Vegetation. II. Georgetown, South Carolina,
W79-01306 2L

TRANSPORTATION
Computerized Costing Model for Inland Waterways Barge Transportation,
W79-01493 6A

TRICHLOROFLUOROMETHANE
Trichlorofluoromethane, a New Hydrologic Tool for Tracing and Dating Ground Water,
W79-01422 2F

TRICKLING FILTERS
A Study for Improving the Aerobic-Media Trickling Filter for Wastewater Treatment,
W79-01123 5D

TROPHIC LEVEL
Pollution Studies of River Khan (Indore) India -- I. Biological Assessment of Pollution,
W79-01018 5A

Quabcag and Quacumquasit Ponds, Water Quality Study, April 1974-April 1975,
W79-01202 5C

TROPHIC POTENTIAL
The Effects of Land Use on Phosphorus Loading: A Case Study - Six Mile Run Reservoir,
W79-01086 5C

TURBULENCE
Some Observed Statistical Properties of Small Scale Turbulence,
W79-01055 2L

Role of Turbulent Mixing in the Dispersion of Pollutants at the Edge of a Large Lake,
W79-01199 5C

TURBULENT FLOW
Some Observed Statistical Properties of Small Scale Turbulence,
W79-01055 2L

ULTRASTRUCTURE (VIRUS INFECTION)
Ultrastructure of the Blue-Green Alga Anacystis Nidulans Infected with AS-1 Virus,
W79-01334 5C

UNDERFLOW GATES
Control of Transients in Series Channel with Gates,
W79-01255 8B

UNDERGROUND STORAGE
The Legalization of Groundwater Shortage,
W79-01142 6E

UNDERGROUND WASTE DISPOSAL
Underground Injection Program Set Under Safe Drinking Water Act,
W79-01154 5G

UNDERGROUND WATER STORAGE
Energy Conservation: Is the Heat Storage Well the Key.,
W79-01228 4B

Heat Storage Wells Conserve Fuels,
W79-01230 4B

UNIONID CLAMS
A Survey of the Freshwater Mussels (Bivalvia: Unionidae) of the Kanawha River of West Virginia,
W79-01435 5C

UNITED-KINGDOM
A Water Pollution Survey, Mainly by British School Children,
W79-01354 5G

UNITED NATIONS
A Constitution for the Oceans: Comments and Suggestions Regarding Part XI of the Informal Composite Negotiating Text,
W79-01149 6E

Should the Law of the Sea Conference Be Saved,
W79-01157 6E

In Search of Common Nodules at UNCLOS III,
W79-01163 6E

Status Report on Law of the Sea Conference.
W79-01176 6E

UNSTEADY FLOW
Unsteady Flow Analysis of Dam-Break Waves,
W79-01264 8B

UPPER HENRYS FORK BASIN (IDAHO)
Water Resources of the Upper Henrys Fork Basin in Eastern Idaho.
W79-01364 6D

UPPER KANAWHA RIVER (W VA)
A Survey of the Freshwater Mussels (Bivalvia: Unionidae) of the Kanawha River of West Virginia,
W79-01435 5C

UPTAKE
The Availability of Sediment-Bound Cobalt, Silver, and Zinc to a Deposit-Feeding Clam,
W79-01468 5B

URANIUM
Impact of the Schwartzwalder Mine on the Water Quality of Ralston Creek, Ralston Reservoir, and Upper Long Lake.
W79-01207 5B

URBAN-RELATED WATER RESOURCES RESEARCH
Water Quality: Problems and Research Needs,
W79-01348 6B

URBAN RUNOFF
Urban Runoff Pollution and Water Quality Planning,
W79-01134 5B

Water Quality: Problems and Research Needs,
W79-01348 6B

URBAN WATER QUALITY
Water Quality: Problems and Research Needs,
W79-01348 6B

URBANIZATION
Simulation of Flood Waves in Channels,
W79-01060 2E

Policy Implications of Urban Land Practices for Groundwater Quality,
W79-01146 5G

USABLE STORAGE
Heat Storage Wells Conserve Fuels,
W79-01230 4B

USSR
Approximate Calculation of Nonstationary Temperature Regime of a Rock-Ice Dam.
W79-01049 8D

Organization of Full-Scale Analyses of Filtration-Thermal Regime of Tailings Dams on Permafrost Foundations,
W79-01050 8D

Tailings Cofferdams on Permafrost Foundations in Yakutskaya ASSR,
W79-01051 8D

Interrelation of Forest and Bog.
W79-01297 2H

UTAH
Salt Pickup by Overland Flow in the Price River Basin, Utah,
W79-01245 5B

The Microbial Ecology of the Great Salt Lake North Arm,
W79-01346 5C

The MicroBial Ecology of the Great Salt Lake,
W79-01347 5C

VALLISNERIA
Effects of Chelated Iron on the Growth of Two Species of Vallisneria,
W79-01446 5C

VAPOR COMPRESSION DISTILLATION
Solar-Assisted Still with Vapor-Compression Option,
W79-01126 3A

VEGETATION
Production and Dynamics of Experimentally Enriched Salt Marsh Vegetation: Belowground Biomass,
W79-01222 5C

VEGETATION ESTABLISHMENT
Controlling Erosion Along Highways with Vegetation or Other Protective Cover,
W79-01059 4D

Some Results of Station Research on the Interrelation of Forest and Bog in Western Siberia,
W79-01298 2H

About the Afforestation of Bogs in Tomsk Region,
W79-01305 2H

VERMONT
Federal Water Pollution Control Act Amendments of 1977 (Part 7, Burlington, VT.).
W79-01170 6E

Water Resources Data for New Hampshire and Vermont, Water Year 1977.
W79-01372 7C

Stream Channelization Impacts on Songbirds and Small Mammals in Vermont,
W79-01431 6G

VERMONT YANKEE FACILITY
Waste Heat Aquaculture,
W79-01467 5C

VERTICAL TUBE EVAPORATION (VTE)
Renovation of Industrial Inorganic Wastewater by Evaporation with Interface Enhancement,
W79-01319 5D

VINYLIDENE CHLORIDE
Market Input/Output Studies. Task I. Vinylidene Chloride,
W79-01500 6B

VIRGINIA
Proposed (Guideline Model) Coastal and Riverine Flood Plain Zoning Ordinance,
W79-01147 6F

VIRUS REMOVAL
The Effectiveness of Sand Filters for the Removal of Specific Viruses from Water Using Selected Cations as Filter Aids,
W79-01352 5D

VIRUSES
Ozonation for Control of Enteric Viruses in Sewage Effluent,
W79-01088 5D

Ultrastructure of the Blue-Green Alga Anacystis Nidulans Infected with AS-1 Virus,
W79-01334 5C

The Effectiveness of Sand Filters for the Removal of Specific Viruses from Water Using Selected Cations as Filter Aids,
W79-01352 5D

VITAMIN B
Group 'B' Vitamins in Peat Soils and Excrement of Invertebrates,
W79-01302 2G

VOLCANIC SOILS
Characteristics of Arizona Ponderosa Pine Stands on Sandstone Soils,
W79-01099 2I

VOLUMETRIC ANALYSIS
Determination of the Bichromate Oxidizability of Sugar Factory Effluents (Opredelenie bikhromatnoy okislyaemosti stochnykh vod sakharnogo zavoda),
W79-01074 5A

Evaluation of Micromolar Complexiметric Titrations for the Determination of the Complexing Capacity of Natural Waters,
W79-01344 5A

The Effectiveness of Sand Filters for the Removal of Specific Viruses from Water Using Selected Cations as Filter Aids,
W79-01352 5D

The Slope of Gran's Plot: A Useful Function in the Examination of Precipitation, the Water-Soluble Part of Airborne Particles, and Lake Water,
W79-01474 5A

WALES
Annual Catchment Losses-A Practical Method,
W79-01248 2D

WASHINGTON
Transmissivity and Hydraulic Conductivity of Saturated Sedimentary Rocks in the Hanford Reservation,
W79-01053 8B

WASTE DILUTION
Sewage from the Yeast Industry: Its Nature and Its Purification (Abwasser der Hefeindustrie, Beschaffenheit und Reinigung),
W79-01075 5D

WASTE DISPOSA
Multiple Effect Evaporation of Water from Water Containing Combustible Sludges,
W79-01398 5E

WASTE DISPOSAL
The Impact of Hazardous Wastes on Ground Water: Part II,
W79-01113 5B

State Approach to Groundwater Quality Protection: The Illinois Experience,
W79-01156 5G

Transformations of Heavy Metals and Plant Nutrients in Dredged Sediments as Affected by Oxidation Reduction Potential and pH, Volume II: Materials and Methods/Results and Discussion,
W79-01201 5C

Effect of Soil Application of Dairy Manure on Germination and Emergence of Some Selected Crops,
W79-01236 5C

An Assessment of Technology for Possible Utilization of Bayer Process Muds,
W79-01315 5D

Economic Analysis of Alternative Sludge Disposal Methods in Vermont,
W79-01328 5E

WASTE HEAT AQUACULTURE
Waste Heat Aquaculture,
W79-01467 5C

WASTE TREATMENT
Equitable Recovery of Industrial Waste Treatment Costs in Municipal Systems, Federal Guidelines.
W79-01206 5D

WASTE WATER DISPOSAL
Quaboag and Quacumquasit Ponds, Water Quality Study, April 1974-April 1975,
W79-01202 5C

WASTE WATER (IRRIGATION)
Characteristics of Small Mammal Populations in Forested and Old Field Habitats Prior to Effluent Spray Irrigation,
W79-01331 5C

WASTE WATER TREATMENT
Ozonation for Control of Enteric Viruses in Sewage Effluent,
W79-01088 5D

Comparison of Iron (III) and Aluminum in Precipitation of Phosphate from Solution,
W79-01095 5D

A Study for Improving the Aerobic-Media Trickling Filter for Wastewater Treatment,
W79-01123 5D

Federal Water Pollution Control Act Amendments of 1977 (Part 7, Burlington, VT.).
W79-01170 6E

How to Obtain Federal Grants to Build Municipal Wastewater Treatment Works.
W79-01210 5G

Cost Estimates for Construction of Publicly-Owned Wastewater Treatment Facilities. Volume 3. Summaries of Technical Data for Combined Sewer Overflows and Stormwater Discharge. 1976 Needs Survey,
W79-01308 5G

Implementing 'Best Management Practices' for Residuals: The Waste Exchange,
W79-01309 5G

Automated Treatment and Recycle of Swine Feedlot Wastewaters,
W79-01316 5D

Removal of Soluble BOD sub 5 Primary Clarifiers,
W79-01317 5D

State-of-the-Art: Military Explosives and Propellants Production Industry, Vol. III -- Wastewater Treatment,
W79-01318 5D

Renovation of Industrial Inorganic Wastewater by Evaporation with Interface Enhancement,
W79-01319 5D

Treatment of Electroplating Wastes by Reverse Osmosis,
W79-01320 5D

Treatment and Disposal of Complex Industrial Wastes,
W79-01321 5D

Apollo County Park Wastewater Reclamation Project, Antelope Valley, California,
W79-01324 5D

Proceedings of a Symposium on Land Treatment of Waste Effluents Center of Adult Education, University of Maryland, April 25-26, 1978.
W79-01329 5D

Recovery and Reuse of Paint Solids from Waste Water,
W79-01391 5D

Method and Device for Separation of Suspended Material from a Fluid Flow,
W79-01392 5D

Process for the Purification of Industrial Effluents,
W79-01396 5D

Method of Purification of Waste Water by Treatment with Zirconium Salt,
W79-01397 5D

Septic Tank-Leaching Pool Arrangement,
W79-01399 5D

Method of Treating Waste Water with Activated Sludge,
W79-01403 5D

Water Purification Process,
W79-01404 5D

Cationic Chlorine-Resistant Polymeric Flocculants and Their Use,
W79-01406 5D

Apparatus for Removing Mercury from Waste Water,
W79-01408 5D

Low Turbulence Settling Tank,
W79-01409 5D

Method of Treatment of an Oxidizable Material by a Biochemical Process,
W79-01412 5D

Method and Apparatus for the Biological Cleansing of Waste Water,
W79-01413 5D

Method for Removing of Multivalent Heavy Metals from Metal Plating Waste Effluents,
W79-01415 5D

Treating Paint Waste Solids,
W79-01416 5D

Apparatus for Use in Water Purification Particularly Sewage Treatments,
W79-01418 5D

Synthesis of Optimal Feedback Control Systems for Fermentations and Biological Waste Treatment Processes,
W79-01428 5D

Pollution Abatement Facilities at National Fish Hatcheries,
W79-01463 5G

WASTES

Pollution Abatement Facilities at National Fish Hatcheries,
W79-01463 5G

WASTEWATER TREATMENT

Sensitivity Analysis of a Phosphorus Removal Strategy Computer Model,
W79-01310 5D

Differential Bed Kinetic Analysis of Heavy Metal Removals by Biological Slimes,
W79-01314 5D

Waste-Water Treatment System,
W79-01420 5D

WATER ALLOCATION (POLICY)

Water -- Demand and Supply: Economic Impacts,
W79-01482 6B

WATER ANALYSIS

Geochemistry of Mine Effluents in the Front Range Mineral Belt of Colorado,
W79-01363 5A

An Automated Procedure for the Simultaneous Determination of Specific Conductance and pH in Natural Water Samples,
W79-01374 2K

A Chemical Budget of a Soft-Water Bog Lake: Benthic Contributions,
W79-01423 2H

Effects of Industrial Wastewater Effluents on Water Quality in Gibson Cove and Kodiak Harbor, Kodiak, Alaska, August 26-29, 1974.
W79-01437 5C

Water Quality Investigation Related to Seafood Processing Wastewater Discharges at Dutch Harbor, Alaska, October 1975, October 1976,
W79-01469 5C

WATER BALANCE

Estimation of Water Balance of Lower Sutlej Catchment Up to Bhakra Dam Site by Thornthwaite's Method,
W79-01257 4A

WATER CHEMISTRY

Geochemical Implications of Summer Monsonnal Rainwater Composition Over India,
W79-01039 2K

Inland Mangroves and Water Chemistry, Barbuda, West Indies,
W79-01215 2K

Fertilizing Fish Ponds: I. Chemistry of the Waters,
W79-01286 5C

Water Chemistry and the Reliability of Electronic Field Instruments,
W79-01333 5A

WATER CIRCULATION

Wind Effects on Surface to Bottom Fronts,
W79-01045 2L

WATER CONSUMPTION (EXCEPT CONSUMPTIVE USE)

Manual of Individual Water Supply Systems.
W79-01311 5F

WATER DEMAND

The Management of Groundwater Supplies,
W79-01117 4B

Water Resources of the Upper Henrys Fork Basin in Eastern Idaho.
W79-01364 6D

Water -- Demand and Supply: Economic Impacts,
W79-01482 6B

WATER DISTRIBUTION (APPLIED)

Manual of Individual Water Supply Systems.
W79-01311 5F

WATER DISTRICTS

Hollister Park Investment Co. V. Goleta County Water District (No Damages to Landowner Denied Water During Water Shortage Emergency).
W79-01190 6E

WATER HYACINTH

Fresh-Water Weeds are a Resource,
W79-01197 5C

Aquatic Weed Management: Some Prospects for the Sudan and the Nile Basin, Report of a Workshop Held at Khartoum, Sudan on 24-29 November 1975.
W79-01205 5G

Review of R & D on Water Hyacinth Utilization in the Philippine Republic,
W79-01470 4A

WATER LAW

Groundwater Law: More Questions Than Answers,
W79-01118 6E

Water Resources and the Land-Water Interface,
W79-01295 6E

WATER LEVEL FLUCTUATIONS

Remote Sensing of Water Levels in Small-Diameter Wells,
W79-01101 7B

WATER LOSS

Annual Catchment Losses-A Practical Method,
W79-01248 2D

WATER MANAGEMEN (APPLIED)

Citizen Participation for Successful Village Water Supply,
W79-01112 6B

WATER MANAGEMENT (APPLIED)

Regional Ground-Water Management,
W79-01105 4B

The Management of Groundwater Supplies,
W79-01117 4B

Policy Implications of Urban Land Practices for Groundwater Quality,
W79-01146 5G

National Water Commission Views Groundwater Protection,
W79-01155 5G

State Approach to Groundwater Quality Protection: The Illinois Experience,
W79-01156 5G

Principles for Water Quality Management,
W79-01165 5G

Little River, Iowa, Watershed Project.
W79-01175 6E

WATER MOVEMENT

Drainage Control to Diminish Nitrate Loss from Agricultural Fields,
W79-01137 5G

WATER POLICY

Principles for Water Quality Management,
W79-01165 5G

Water Contamination by Toxic Pollutants: An Assessment of Regulation,
W79-01174 6E

State Waters-General Provisions.
W79-01183 6E

Water -- Demand and Supply: Economic Impacts,
W79-01482 6B

WATER POLLUTION

The Ordinary High Water Mark: Attempts at Settling an Unsettled Boundary Line,
W79-01009 6E

The Impact of Hazardous Wastes on Ground Water: Part II,
W79-01113 5B

Federal Water Pollution Control Act Amendments of 1977 (Part 6, New Orleans, LA.).
W79-01169 6E

Impact of the Schwartzwalder Mine on the Water Quality of Ralston Creek, Ralston Reservoir, and Upper Long Lake.
W79-01207 5B

Waste Source Investigations, Kingsport, Tennessee.
W79-01208 5B

Evaluation of the Impact of the Mines Development, Incorporated Mill on Water Quality Conditions in the Cheyenne River.
W79-01209 5B

Organic Compounds in the Delaware River,
W79-01252 5B

Effect of Acid Mine Drainage on the pH of Lake Toya, Japan,
W79-01258 5B

A Water Pollution Survey, Mainly by British School Children,
W79-01354 5G

WATER POLLUTION CONTROL

Recovery of Nitrosamines from Water,
W79-01006 5D

In Pursuit of Clean Oceans - A Review of the Marine Protection, Research, and Sanctuaries Act,
W79-01144 5G

Problems in Attempting to Translate Statutory Standards into Emission Limitations Under Air and Water Pollution Control Legislation,
W79-01151 5G

A Comparison of Bethlehem Steel Corp V. Train with Republic Steel Corp. V. Train: The Sixth Circuit,
W79-01162 5G

Federal Water Pollution Control Act Amendments of 1977 (Part 9, Washington, D.C.).
W79-01171 6E

Water Contamination by Toxic Pollutants: An Assessment of Regulation,
W79-01174 6E

Analysis of Economic Effect of Environmental Regulations on Integrated Iron and Steel Industry. Volume II,
W79-01194 5G

The Effect of Some Basic Statistical and Biological Principles on Water Pollution Control,
W79-01243 5G

An Economic Evaluation of Cropland Use as a Control for Sediment Nonpoint Pollution,
W79-01498 5G

The Response of Firms to Pollution Charges,
W79-01499 5G

WATER POLLUTION EFFECTS

Limnological Characteristics of the Potomac Estury,
W79-01195 5C

The Importance of Water for the Spread of Potentially Pathogenic Mycobacteria: II. Growth of Mycobacteria in Water Models, (In German),
W79-01259 5C

Organic Contaminants,
W79-01471 5C

WATER POLLUTION SOURCES

In Pursuit of Clean Oceans - A Review of the Marine Protection, Research, and Sanctuaries Act,
W79-01144 5G

Waste Source Investigations, Kingsport, Tennessee.
W79-01208 5B

Organic Contaminants,
W79-01471 5C

Chloro-Organics in Surface Water Sources for Potable Water,
W79-01472 5B

Coralville Water Quality Study Annual Report, Water Year October 1, 1975 to September 30, 1976,
W79-01473 5B

Market Input/Output Studies. Task I. Vinylidene Chloride,
W79-01500 6B

WATER POLLUTION TREATMENT

Soil Erosion Control Policies - Institutional Alternatives and Costs,
W79-01164 5G

Removal and Separation of Spilled Hazardous Materials from Impoundment Bottoms,
W79-01307 5G

Treatment of Electroplating Wastes by Reverse Osmosis,
W79-01320 5D

Recovery and Reuse of Paint Solids from Waste Water,
W79-01391 5D

Method and Device for Separation of Suspended Material from a Fluid Flow,
W79-01392 5D

Oil Boom for Damming and Collecting a Floating Oil Slick,
W79-01394 5G

Process for the Purification of Industrial Effluents,
W79-01396 5D

Septic Tank-Leaching Pool Arrangement,
W79-01399 5D

Method of Purifying Water,
W79-01402 5F

Method of Treating Waste Water with Activated Sludge,
W79-01403 5D

Water Purification Process,
W79-01404 5D

Cationic Chlorine-Resistant Polymeric Flocculants and Their Use,
W79-01406 5D

Methods and Compositions for Dispersing Oil Films,
W79-01407 5G

Apparatus for Removing Mercury from Waste Water,
W79-01408 5D

Low Turbulence Settling Tank,
W79-01409 5D

Method and Apparatus for the Biological Cleansing of Waste Water,
W79-01413 5D

Treating Paint Waste Solids,
W79-01416 5D

Apparatus for Use in Water Purification Particularly Sewage Treatments,
W79-01418 5D

Effluent Oil Collecting Vessel,
W79-01419 5G

Waste-Water Treatment System,
W79-01420 5D

WATER PURIFICATION

Removal of Metallic Impurities from Water by Electrochemical Methods,
W79-01121 5D

Recovery and Reuse of Paint Solids from Waste Water,
W79-01391 5D

Method and Device for Separation of Suspended Material from a Fluid Flow,
W79-01392 5D

System for Removal of Toxic Heavy Metals from Drinking Water,
W79-01393 5F

Water Sterilization Apparatus,
W79-01395 5F

Method of Purification of Waste Water by Treatment with Zirconium Salt,
W79-01397 5D

Algaecidal Composition,
W79-01401 5F

Method of Purifying Water,
W79-01402 5F

Water Purification Process,
W79-01404 5D

Purification of Water for Boiler,
W79-01405 5F

Low Turbulence Settling Tank,
W79-01409 5D

Method and Apparatus for the Biological Cleansing of Waste Water,
W79-01413 5D

Purification of Water by Reverse Osmosis Using a Supported Semi-Permeable Membrane,
W79-01414 5F

WATER QUALITY

Pollution Studies of River Khan (Indore) India -- I. Biological Assessment of Pollution,
W79-01018 5A

Gull Droppings and Their Effects on Water Quality,
W79-01041 5B

Comparison of Iron (III) and Aluminum in Precipitation of Phosphate from Solution,
W79-01095 5D

Characteristics of Arizona Ponderosa Pine Stands on Sandstone Soils,
W79-01099 2I

Regional Ground-Water Management,
W79-01105 4B

Urban Runoff Pollution and Water Quality Planning,
W79-01134 5B

A Pilot Study of Drinking Water Systems On and Along the National System of Interstate and Defense Highways.
W79-01312 5F

Feasibility Study, Fly Ash Reclamation of Surface Mines, Hillman State Park, Feasibility Study,
W79-01323 5G

Water Quality: Problems and Research Needs.
W79-01348 6B

Water Quality and Control of Plant Pathogens in Irrigation Reuse,
W79-01358 5D

Water Resources of the Upper Henrys Fork Basin in Eastern Idaho.
W79-01364 6D

Dissolved-Solids Concentrations of Water in the Niagara Aquifer, Wisconsin.
W79-01369 7C

Water Resources Data for Florida, Water Year 1977--Volume 2A: Southern Florida, Surface Water.
W79-01370 7C

Water Resources Data for Florida, Water Year 1977--Volume 2B: Southern Florida, Ground Water.
W79-01371 7C

Water Resources Data for Florida, Water Year 1977--Volume 1: Northeast Florida.
W79-01373 7C

Chemical Quality of Water Used for Municipal Supply in Florida, 1975,
W79-01375 7C

Program for Monitoring Surface-Water Quality in Florida,
W79-01376 7C

Gas-Driven Pump for Ground-Water Supplies,
W79-01378 8C

Water-Resources Investigations of the U.S. Geological Survey in Montana, October 1977 Through September 1978.
W79-01379 7C

Water-Quality Indices for Specific Water Uses,
W79-01381 5G

Dissolved-Solids Concentrations and Loads in Florida Surface Waters,
W79-01382 7C

Ground-Water Resources and Geology of Columbia County, Wisconsin,
W79-01384 2F

A Dynamic Water Quality Model of Lake Biwa - A Simulation Study of the Lake Eutrophication,
W79-01475 5C

WATER QUALITY CONTROL

Policy Implications of Urban Land Practices for Groundwater Quality,
W79-01146 5G

National Water Commission Views Groundwater Protection,
W79-01155 5G

Principles for Water Quality Management,
W79-01165 5G

Tap Water and Timber - The Costs of Multiple Use,
W79-01166 5G

Philadelphia Chewing Gum Co. V. Commonwealth of Pennsylvania, Dept. of Environmental Resources (Land-Owners and Occupiers Liable for Correction of Polluting Condition).
W79-01191 6E

Water Sterilization Apparatus,
W79-01395 5F

Algaecidal Composition,
W79-01401 5F

Methods and Compositions for Dispersing Oil Films,
W79-01407 5G

Method for Sequestering Metal Ions,
W79-01417 5G

Coralville Water Quality Study Annual Report, Water Year October 1, 1975 to September 30, 1976,
W79-01473 5B

WATER QUALITY INDICES

Water-Quality Indices for Specific Water Uses,
W79-01381 5G

WATER QUALITY STANDARDS

Problems in Attempting to Translate Statutory Standards into Emission Limitations Under Air and Water Pollution Control Legislation,
W79-01151 5G

Thermal Discharges and Power Plant Intakes: Section 316 in Perspective,
W79-01159 5G

Water-Quality Indices for Specific Water Uses,
W79-01381 5G

Effects of Industrial Wastewater Effluents on Water Quality in Gibson Cove and Kodiak Harbor, Kodiak, Alaska, August 26-29, 1974.
W79-01437 5C

Water Quality Investigation Related to Seafood Processing Wastewater Discharges at Dutch Harbor, Alaska, October 1975, October 1976,
W79-01469 5C

WATER RESOURCES

Urban Runoff Pollution and Water Quality Planning,
W79-01134 5B

Water Resources and Other Related Laws of Illinois.
W79-01168 6E

The Water Factor in the Social History of Honolulu, Hawaii,
W79-01353 6B

WATER RESOURCES DEVELOPMENT

The Ordinary High Water Mark: Attempts at Settling an Unsettled Boundary Line,
W79-01009 6E

Little River, Iowa, Watershed Project.
W79-01175 6E

State Waters-General Provisions.
W79-01183 6E

Water Resources and the Land-Water Interface,
W79-01295 6E

The Water Factor in the Social History of Honolulu, Hawaii,
W79-01353 6B

Quantification of Recreational Use of the Coralville Reservoir,
W79-01361 6B

Water -- Demand and Supply: Economic Impacts,
W79-01482 6B

WATER REUSE

Wastewater Treatment in the Sugar Industry (II) (Abwasseraufbereitung der Zuckerwarenindustrie (II)).
W79-01072 5D

Effluent Treatment Plant Cleans up Down the Valleys,
W79-01078 5D

Direct Injection of Reclaimed Water into an Aquifer,
W79-01108 5D

Apollo County Park Wastewater Reclamation Project, Antelope Valley, California,
W79-01324 5D

Water Quality and Control of Plant Pathogens in Irrigation Reuse,
W79-01358 5D

Wastewater Recycling on Forest Lands,
W79-01424 5D

WATER RIGHTS

Groundwater Law: More Questions Than Answers,
W79-01118 6E

The Legalization of Groundwater Shortage,
W79-01142 6E

Indians and the Environment: An Examination of Jurisdictional Issues Relative to Environmental Management,
W79-01143 6E

Hollister Park Investment Co. V. Goleta County Water District (No Damages to Landowner Denied Water During Water Shortage Emergency).
W79-01190 6E

WATER SAMPLING

Recovery of Nitrosamines from Water,
W79-01006 5D

Tidal Sampler,
W79-01388 7B

WATER STORAGE

Regional Water Supply Capacity Expansion with Seasonal Demands and Energy Costs,
W79-01002 6A

Using Large Diameters to Increase Well Storage,
W79-01109 8B

WATER STRESS

Corn and Alfalfa Production as Influenced by Irrigation and Salinity,
W79-01136 3C

WATER SUPPLY

Citizen Participation for Successful Village Water Supply,
W79-01112 6B

Hollister Park Investment Co. V. Goleta County Water District (No Damages to Landowner Denied Water During Water Shortage Emergency).
W79-01190 6E

Highway Construction Impact on Water-Supply Lakes,
W79-01260 4C

Manual of Individual Water Supply Systems.
W79-01311 5F

A Pilot Study of Drinking Water Systems On and Along the National System of Interstate and Defense Highways.
W79-01312 5F

A Manual for the Evaluation of a State Drinking Water Supply Program,
W79-01313 5F

Chemical Quality of Water Used for Municipal Supply in Florida, 1975,
W79-01375 7C

Water-Quality Indices for Specific Water Uses,
W79-01381 5G

Water -- Demand and Supply: Economic Impacts,
W79-01482 6B

WATER SUPPLY DEVELOPMENT

A Manual for the Evaluation of a State Drinking Water Supply Program,
W79-01313 5F

WATER TABLE
Digital-Model Simulation of the Glacial-Outwash Aquifer, Otter Creek-Dry Creek Basin, Cortland County, New York,
W79-01377 2F

WATER TANKS
Using Large Diameters to Increase Well Storage,
W79-01109 8B

WATER TEMPERATURE
The Effect of Temperature on the Development of Diapausing and Subitaneous Eggs in Several Freshwater Copepods,
W79-01033 5C

Influence of Temperature on Growth Promotion and Body Composition of Carp (Cyprinus Carpio) Due to Bovine Growth Hormone,
W79-01438 5C

The Behavior of Juvenile Atlantic Salmon (Salmo Salar) and Brook Trout (Salvelinus Fontinalis) with Regard to Temperature and to Water Velocity,
W79-01441 5C

Effect of Thermal Shock on Predator Avoidance by Larvae of Two Fish Species,
W79-01454 5C

The Influence of Temperature and Salinity on the Toxicity of Hexavalent Chromium to the Grass Shrimp Palaemonetes Pugio (Holthuis),
W79-01457 5C

Waste Heat Aquaculture,
W79-01467 5C

WATER TREATMENT
Fluoride Removal from Potable Water Supplies,
W79-01351 5F

System for Removal of Toxic Heavy Metals from Drinking Water,
W79-01393 5F

Water Sterilization Apparatus,
W79-01395 5F

Algaecidal Composition,
W79-01401 5F

Method of Purifying Water,
W79-01402 5F

Purification of Water for Boiler,
W79-01405 5F

Purification of Water by Reverse Osmosis Using a Supported Semi-Permeable Membrane,
W79-01414 5F

Method for Sequestering Metal Ions,
W79-01417 5G

WATER UTILIZATION
Analysis of Water Flow Problems in the Hells Canyon of the Snake River,
W79-01359 4A

WATER VALVES
A Water Well Evaluation System,
W79-01102 8B

WATER WELLS
A Water Well Evaluation System,
W79-01102 8B

Well Logs...Are They Really Necessary,
W79-01119 7C

WATER YIELD
Characteristics of Arizona Ponderosa Pine Stands on Sandstone Soils,
W79-01099 2I

Probable Yields of Wells in the Niagara Aquifer, Wisconsin,
W79-01367 7C

WATERFOWL
Waterfowl Collisions with Power Lines at a Coal-Fired Power Plant,
W79-01434 6G

WATERSHED BASINS
Geomorphologic Characteristics of Fourteen Indiana Watersheds Obtained from a Computer Data Bank of Stream Networks,
W79-01426 4D

WATERSHED MANAGEMENT
Impact of Floods and Alternative Flood Control Measures on the Devils Lake Basin Economy,
W79-01122 6B

Little River, Iowa, Watershed Project.
W79-01175 6E

Optimal Operation of Large Agricultural Watersheds with Water Quality Constraints,
W79-01355 4D

WATERSHEDS (BASINS)
Pre-Management Assessment of Aquatic Macroinvertebrates in a Small, Sedimentary Drainage Area of the Maumee and Lake Erie Basin.
W79-01096 5C

Meeker v. City of Clinton (Flood Damages Caused by Municipal and Railroad Negligence),
W79-01181 6E

Annual Catchment Losses-A Practical Method,
W79-01248 2D

Estimation of Water Balance of Lower Sutlej Catchment Up to Bhakra Dam Site by Thornthwaite's Method,
W79-01257 4A

WAVES (WATER)
Drift Velocity of Surface Films Over Waves,
W79-01139 5B

Analytic Solutions for Computer Flow Model Testing,
W79-01256 2L

Unsteady Flow Analysis of Dam-Break Waves,
W79-01264 8B

Flood Plain Inundation Caused by Dam Failure,
W79-01265 8B

WEATHER FORECASTING
Prediction of Convective Activity Using a System of Parasitic-Nested Numerical Models,
W79-01056 2B

WEATHER MODIFICATION
Randomized Cloud Seeding in the San Juan Mountains, Colorado,
W79-01035 3B

Heat and Thrust Requirements of a Thermal Fog Dispersal System,
W79-01058 3B

A Societal Assessment of the Proposed Sierra Snowpack Augmentation Project,
W79-01063 3B

WELL CASINGS
A Look at RPM Plastic,
W79-01114 8G

WELL DATA
Well Logs...Are They Really Necessary,
W79-01119 7C

WELL DEVELOPMENT
The Use of Inclined Boreholes for Well Development,
W79-01107 8B

WELLS
Remote Sensing of Water Levels in Small-Diameter Wells,
W79-01101 7B

Using Large Diameters to Increase Well Storage,
W79-01109 8B

Drilling Large Diameter Wells: The Proof is in the Planning,
W79-01110 8B

WEST VIRGINIA
The Development and Testing of a Dam-Break Flood Forecasting Model,
W79-01270 8B

A Survey of the Freshwater Mussels (Bivalvia: Unionidae) of the Kanawha River of West Virginia,
W79-01435 5C

WESTERN GOVERNORS POLICY OFFICE
Legitimacy of Western Identity in an Economic Balance Water - Land - Energy - People,
W79-01481 6B

WETLANDS
Hydrology of the Nevin Wetland Near Madison, Wisconsin,
W79-01213 2H

Relationships Between Mineral Supply and Growth of Narthecium Ossifragum (L.) Huds. on Mire Ecosystems,
W79-01216 2H

Habitat Use and Home Range of Mallards Breeding in Minnesota,
W79-01287 2I

The Effect of Several Physical and Chemical Factors Upon the Distribution of Benthic Macroinvertebrates in Dunham Pond, Connecticut,
W79-01330 5C

Inland Wetland Definitions,
W79-01335 6E

WHITE-FOOTED MICE
Characteristics of Small Mammal Populations in Forested and Old Field Habitats Prior to Effluent Spray Irrigation,
W79-01331 5C

WHITE RIVER WATERSHED (VERMONT)
Stream Channelization Impacts on Songbirds and Small Mammals in Vermont,
W79-01431 6G

WHTE PERCH
Chlorine effects on Larval Development of Striped Bass (Morone Saxatilis), White Perch (M. Americana) and Blueback Herring (Alosa Aestivalis),
W79-01456 5C

WILDLIFE HABITATS
Characteristics of Small Mammal Populations in Forested and Old Field Habitats Prior to Effluent Spray Irrigation,
W79-01331 5C

Great Blue Herons Respond to Nesting Habitat Loss,
W79-01432 6G

WIND EROSION
Sand Transport Model of Barchan Dune Equilibrium,
W79-01043 2J

WIND-GENERATED WAVES
Drift Velocity of Surface Films Over Waves,
W79-01139 5B

WIND VELOCITY
Drift Velocity of Surface Films Over Waves,
W79-01139 5B

WINDS
Wind Effects on Surface to Bottom Fronts,
W79-01045 2L

WISCONSIN
Metallic Mining Reclamation Act,
W79-01188 6E

Hydrology of the Nevin Wetland Near Madison, Wisconsin,
W79-01213 2H

Accumulation of Arsenic in Sediments of Lakes Treated with Sodium Arsenite,
W79-01253 5B

Probable Yields of Wells in the Niagara Aquifer, Wisconsin,
W79-01367 7C

Dissolved-Solids Concentrations of Water in the Niagara Aquifer, Wisconsin,
W79-01369 7C

WITHLACOOCHEE RIVER (FLA)
Hydrogeologic Maps of a Flood Detention Area Proposed by Southwest Florida Water Management District Green Swamp Area, Florida,
W79-01383 7C

YEASTS
Sewage from the Yeast Industry: Its Nature and Its Purification (Abwasser der Hefeindustrie, Beschaffenheit und Reinigung),
W79-01075 5D

YELLOW-TAIL
On the Pharmacological Effects of Diisopropylnaphthalene on Yellow-Tail (In Japanese),
W79-01450 5C

YELLOW WATER LILY
Phosphorus Cycling in Nuphar luteum Communities in the Lower Chowan River, North Carolina,
W79-01326 5C

ZINC
Distribution of Trace Metals and Sediments in Estuaries of the Kum River and the Mankyung River,
W79-01014 5B

Uptake of Zinc by the Aquatic Larvae of Simulium Ornatipes (Diptera: Newatocera),
W79-01026 5C

The Availability of Sediment-Bound Cobalt, Silver, and Zinc to a Deposit-Feeding Clam,
W79-01468 5B

ZIRCONIUM SALTS TREATMENT
Method of Purification of Waste Water by Treatment with Zirconium Salt,
W79-01397 5D

ZOOPLANKTON
The Effect of Temperature on the Development of Diapausing and Subitaneous Eggs in Several Freshwater Copepods,
W79-01033 5C

A Preliminary Survey of the Zooplankton and Benthos of an Arctic Lake Near Prudhoe Bay, Alaska,
W79-01427 2H

AUTHOR INDEX

ABBI, S. D. S.
Estimation of Water Balance of Lower Sutlej Catchment Up to Bhakra Dam Site by Thornthwaite's Method,
W79-01257 4A

ABDELMESSIH, A. H.
The Effect of Hydraulic Jump on the Performance of a Single-Stage Flash Evaporator,
W79-01238 3A

ADACHI, N.
A Dynamic Water Quality Model of Lake Biwa - A Simulation Study of the Lake Eutrophication,
W79-01475 5C

ADELMAN, I. R.
Influence of Temperature on Growth Promotion and Body Composition of Carp (Cyprinus Carpio) Due to Bovine Growth Hormone,
W79-01438 5C

ADRIANO, D. C.
Effect of Soil Application of Dairy Manure on Germination and Emergence of Some Selected Crops,
W79-01236 5C

AHLERT, R. C.
Oxidation-Reduction Chemistry And Aqueous Ammonium Oxidation in the Estimation of Nitrate by the Cadmium Reduction Method,
W79-01100 5B

AISAKA, K.
Photo-Decomposition of Aqueous Solutions of Phenol (Fenooru suiyoeki no hikari bunkai),
W79-01069 5D

AKATSUKA, H.
Method of Treating Waste Water with Activated Sludge,
W79-01403 5D

AKHTAR, M. A.
Nutrient Fluxes in Precipitation, Throughfall, and Stemflow in an Oak-Hickory Forest,
W79-01246 2I

AKIM, G. L.
Oxidation of Lyes and Treatment of Wastewater with Gaseous Oxygen (Okispenie shchelokov i obrabotka stochnykh vod gazoobraznym kislorodom),
W79-01083 5D

ALEXANDER, M.
Recovery of Nitrosamines from Water,
W79-01006 5D

ALTURA, D.
Hydrogen Evolution and Corrosion Behavior of Fe-Ni Alloys in H2SO4 - Effect of Temperature, Cl- and Benzatriazole,
W79-01235 8G

AMEIN, M.
The Dam-Break Wave and the Bore Collapse on a Beach,
W79-01263 8B

AMIARD-TRIQUET, A.
Methods of Contamination of Two Freshwater Food Chains by Cobalt 60: I. Direct Contamination of the Organisms by the Water (Modalites de la Contamination de Deux Chaines Trophiques Dulcaquicoles par le Cobalt 60: I. Contamination Directe des Organismes par L'Eau),
W79-01442 5C

ANDERSON, D. B.
Fluid Development for Drilling Sloughing and Heaving Shales,
W79-01104 8G

ANDERSON, F. O.
Primary Production in a Shallow Water Lake with Special Reference to a Reed Swamp,
W79-01223 5C

ANDERSON, J. C.
Energy and the Colorado River,
W79-01167 3E

ANDERSON, W. L.
Waterfowl Collisions with Power Lines at a Coal-Fired Power Plant,
W79-01434 6G

ANGELIER, N.
Method of Treatment of an Oxidizable Material by a Biochemical Process,
W79-01412 5D

AOYAMA, I.
Experimental Study on the Concentration Process of Trace Element Through a Food Chain from the Viewpoint of Nutrition Ecology,
W79-01461 5B

APPLEMAN, R.
Use of Unicellular Algae for Evaluation of Potential Aquatic Contaminants,
W79-01476 5A

ARMSTRONG, F. A. I.
Organic Contaminants,
W79-01471 5C

ARNOLD, L. E.
Nutrient Fluxes in Precipitation, Throughfall, and Stemflow in an Oak-Hickory Forest,
W79-01246 2I

ASAKURA, S.
Electrodissolution of Nickel in Molten LiCl-KCl,
W79-01234 8G

ASHIROV, A.
Extraction of Ammonium Ions from Wastewaters Generated in the Production of Compound Fertilizers and Their Utilization by Ion-Exchange Method (Izvlechenie ionov ammoniya iz stochnykh vod proizvodsty slozhnykh udobrenii ikh utilizatsiya metodom ionnogo obmena),
W79-01068 5D

AURAND, D.
Nitrate and Nitrite in the Surface Waters of Two Delaware Salt Marshes,
W79-01291 5B

AYUKAWA, B.
Method of Purification of Waste Water by Treatment with Zirconium Salt,
W79-01397 5D

BAKER, B. A.
Hydrocarbons in the Marine Environment of Port Valdez, Alaska,
W79-01254 5B

BAKER, M. JR.
Characteristics of Arizona Ponderosa Pine Stands on Sandstone Soils,
W79-01099 2I

BALASUBRAMANIAN, V.
Field Study of Solute Movement in a Highly Aggregated Oxisol with Intermittent Flooding: I. Nitrate,
W79-01360 3F

BALHAR, L.
Laboratory Investigation of Water Pollution by Organic Substances in Flax Wastes Delignification (Laboratorne sledovanie organickeho znecistenia vod pri delignifikacii lanovych odpadov),
W79-01085 5B

BALL, I. J.
Habitat Use and Home Range of Mallards Breeding in Minnesota,
W79-01287 2I

BALLOFFET, A.
Simulation of Dam Break Flooding Under Normal and Probable Maximum Flood Conditions,
W79-01277 8B

BANKS, H. O.
National Water Commission Views Groundwater Protection,
W79-01155 5G

BARANOWSKI, A.
Nitrogen and Phosphorus Fertilization of Aquatic Vascular Plants and Algae in Replicated Ponds. I. Initial Response to Fertilization,
W79-01224 5C

BARBER, R. T.
Suspension-Feeding Aquaculture Systems: Effects of Phytoplankton Concentration and Temperature on Growth of the Bay Scallop,
W79-01285 5C

BARKLEY, M. B.
Ultrastructure of the Blue-Green Alga Anacystis Nidulans Infected with AS-1 Virus,
W79-01334 5C

BARNES, D. A.
Sensitivity Analysis of a Phosphorus Removal Strategy Computer Model,
W79-01310 5D

BARRINGTON, K.
Building Public/Private Cooperation in the Coastal Zone,
W79-01145 6E

BAY, R. W.
Water Quality and Control of Plant Pathogens in Irrigation Reuse,
W79-01358 5D

BAYLEY, S.
Changes in Submerged Aquatic Macrophyte Populations at the Head of Chesapeake Bay, 1958-1975,
W79-01030 5C

BAYNE, B. L.
In Vitro Changes in the Activity of ATPases in the Gills of Carcinus Maenas Exposed to Various Concentrations of p,p'-DDT,
W79-01032 5C

BELL, G. R.
Mortalities of Pen-Reared Salmon Associated with Blooms of Marine Algae,
W79-01462 5C

BELL, J. N. B.
The Response of Empetrum Nigrum L. to Different Mire Water Regimes, with Special Reference to Wybunbury Moss, Cheshire and Featherbed Moss, Derbyshire,
W79-01293 5C

BEN-ASHER, J.
An Energy Budget Analysis of Evapotranspiration from Saltcedar,
W79-01231 3B

BERGEN, G. S. P.
Thermal Discharges and Power Plant Intakes: Section 316 in Perspective,
W79-01159 5G

BERGER, V. Y.
Effect of Dibasol and Vitamin B12 on the Larvae of Aurelia Aurita (Soyphoza) in a Reduced Saline Medium,
W79-01451 5C

BERMAN, T.
Quantitative and Qualitative Changes in the Phytoplankton of Lake Kinneret, Israel, 1972-1975,
W79-01198 5C

BEZELLA, D. A.
Algaecidal Composition,
W79-01401 5F

BIDLEMAN, T. F.
Chlorinated Hydrocarbons in Marine Insects,
W79-01023 5B

BIESZKIEWICZ, E.
Effect of Copper and Tri- and Hexavalent Chromium on the Work of an Activated Sludge,
W79-01079 5D

BINGHAM, F. T.
Cadmium Availability to Rice in Sludge-Amended Soil Under 'Flood' and 'Nonflood' Culture,
W79-01127 5E

Growth and Cadmium Accumulation of Plants Grown on a Soil Treated with a Cadmium-Enriched Sewage Sludge,
W79-01282 5C

Yield and Cadmium Accumulation of Forage Species in Relation to Cadmium Content of Sludge-Amended Soil,
W79-01237 5C

BISHOP, H. K.
Scaling and Corrosion in an Experimental Geothermal Power Plants,
W79-01106 3C

BLACKARD, J.
Effect of Mulching on Sediment in Runoff from Simulated Rainfall,
W79-01130 4D

Evaluation of Wild Oat Straw as a Soil Erosion Retardant Using Simulated Rainfall,
W79-01131 4D

BLANTON, J. O. III.
Flood Plain Inundation Caused by Dam Failure,
W79-01265 8B

BLASER, R. E.
Controlling Erosion Along Highways with Vegetation or Other Protective Cover,
W79-01059 4D

BLODGETT, J. E.
Water Contamination by Toxic Pollutants: An Assessment of Regulation,
W79-01174 6E

BLOOMER, I.
Treating Paint Waste Solids,
W79-01416 5D

BLUNDO, R.
The Toxic Effects of the Water Soluble Fractions of No. 2 Fuel Oil and Three Aromatic Hydrocarbons on the Behavior and Survival of Barnacle Larvae,
W79-01025 5C

BOATMAN, D. J.
Monthly Determinations of the Concentrations of Sodium, Potassium, Magnesium and Calcium in the Rain and Pools of the Silver Flowe National Nature Reserve.
W79-01212 2K

BODLEY, W. E.
Control of Transients in Series Channel with Gates,
W79-01255 8B

BOLOHAN, M.
Investigations of the Decoloration of Wastewaters Generated in Confier Sulfate Pulp Mills (Cercetari privind decolorarea apelor reziduale provenite de la fabricarea celulozei sulfat din rasinoase),
W79-01084 5D

BOND, M. T.
The Dewatering of Lime-Algae Sludge on Sand Drying Beds,
W79-01349 5D

BONHAM, K.
Chronic Exposure of Chinook Salmon Eggs and Alevins to Gamma Irradiation: Effects on Their Return to Freshwater as Adults,
W79-01455 5C

BORGHESE, E. M.
A Constitution for the Oceans: Comments and Suggestions Regarding Part XI of the Informal Composite Negotiating Text,
W79-01149 6E

BORMAN, R. G.
Ground-Water Resources and Geology of Columbia County, Wisconsin,
W79-01384 2F

BOULDING, E.
Population Growth and Socio-Economic Balance: How to Visualize Alternative Futures,
W79-01485 6B

BOULENGER, P.
Method of Treatment of an Oxidizable Material by a Biochemical Process,
W79-01412 5D

BOYD, C. E.
Nitrogen Fertilization of Ponds,
W79-01439 5C

BOYD, R. E.
Market Input/Output Studies. Task I. Vinylidene Chloride,
W79-01500 6B

BRADLEY, M. D.
Environment, Power, and Impact Assessment: The Politics of Information,
W79-01229 6G

BRANDT, H. T.
Apollo County Park Wastewater Reclamation Project, Antelope Valley, California,
W79-01324 5D

BRAS, R. L.
Time Averaged Areal Mean of Precipitation: Estimation and Network Design,
W79-01357 2B

BRENNAN, T. P.
Recovery and Reuse of Paint Solids from Waste Water,
W79-01391 5D

BRICARELLO, J. R.
Scaling and Corrosion in an Experimental Geothermal Power Plants,
W79-01106 3C

BRICE, R. R.
Remote Sensing of Water Levels in Small-Diameter Wells,
W79-01101 7B

BROOKS, W. A.
Computerized Costing Model for Inland Waterways Barge Transportation,
W79-01493 6A

BROSETT, C.
The Slope of Gran's Plot: A Useful Function in the Examination of Precipitation, the Water-Soluble Part of Airborne Particles, and Lake Water,
W79-01474 5A

BROWN, J.
State-of-the-Art: Military Explosives and Propellants Production Industry, Vol. III -- Wastewater Treatment,
W79-01318 5D

BROWN, R. J.
A Simulation of the Hydraulic Events During and Following the Teton Dam Failure,
W79-01269 8B

BRUVOLD, W. H.
Reconciliation of Apparent Nonequivalence Among Alternative Rating Methods,
W79-01240 6B

BRYAN, G. W.
Inland Mangroves and Water Chemistry, Barbuda, West Indies,
W79-01215 2K

BUCK, J.D.
Sedimentation and Microbial Metabolism in a Shallow Estuary,
W79-01091 2J

BURGESS, P.
Legitimacy of Western Identity in an Economic Balance Water - Land - Energy - People,
W79-01481 6B

CAMPBELL, G. S.
Drift Velocity of Surface Films Over Waves,
W79-01139 5B

CAMPBELL, I. C.
A Biological Investigation of an Organically Polluted Urban Stream in Victoria,
W79-01016 5C

CAMPBELL, W. J.
Microwave Remote Sensing of Sea Ice in the Aidjex Main Experiment,
W79-01386 2C

CAREY, A. E.
Metabolism of Polychlorinated Biphenyls by Marine Bacteria,
W79-01443 5C

CARLILE, B. L.
Nitrogen and Irrigation Management to Reduce Return-Flow Pollution in the Columbia Basin,
W79-01001 5G

CARLSON, A. R.
Effect of Long-Term Reduction and Diel Fluctuation in Dissolved Oxygen on Spawning of Black Crappie, Pomoxis Nigromaculatus,
W79-01440 5C

CARLSON, K.
Septic Tank-Leaching Pool Arrangement,
W79-01399 5D

CARTER, J. G. T.
Uptake of Zinc by the Aquatic Larvae of Simulium Ornatipes (Diptera: Newatocera),
W79-01026 5C

CARVER, J. A. JR.
Legal and Institutional Planning for Macro-Conservation Measures,
W79-01227 6E

CECILIO, C. B.
Criteria for Routing the Dam-Break Flood,
W79-01278 8B

CEDERHOLM, C. J.
The Impact of Logging on Salmonid Resources in the Pacific Northwest,
W79-01466 4C

CHAMBERLAIN, A. J.
Acute Effects of Underwater Construction Blasting on Fishes in Long Point Bay, Lake Erie,
W79-01452 5C

CHAMBERLAIN, P. G.
Field Permeability Methods for In-Place Leaching,
W79-01111 2F

CHAMBLEE, J. A.
Cost Estimates for Construction of Publicly-Owned Wastewater Treatment Facilities. Volume 3. Summaries of Technical Data for Combined Sewer Overflows and Stormwater Discharge. 1976 Needs Survey,
W79-01308 5G

CHAN, M. C.
Specification of Cellulose Acetate to be Used in Semipermeable Membranes,
W79-01129 3A

CHANCE, D. A.
Polarization and Photopotentials of InSb in NaOH,
W79-01233 8G

CHANG, A. C.
Effect of Soil Application of Dairy Manure on Germination and Emergence of Some Selected Crops,
W79-01236 5C

CHANG, P. W.
Ozonation for Control of Enteric Viruses in Sewage Effluent,
W79-01088 5D

CHAO, B. T.
Induced Crystallization of Large Free Ice Crystals in Slowly Flowing Brine,
W79-01429 3A

CHARI, K. S.
Hydrogen Recovery from Purge Gas of Ammonia Plants,
W79-01067 5D

CHECK, L. M.
Uptake and Release of Petroleum by Intertidal Sediments at Port Valdez, Alaska,
W79-01022 5B

CHEN, C-L.
Dam-Break Flood Wave Computation by Method of Characteristics and Linearized Implicit Schemes,
W79-01274 8B

CHEN, E. H.
Precision Analysis for Waterborne Chrysotile Asbestos by Transmission Electron Microscopy,
W79-01010 5A

CHEN, R.
Quantification of Recreational Use of the Coralville Reservoir,
W79-01361 6B

CHENG, L.
Chlorinated Hydrocarbons in Marine Insects,
W79-01023 5B

CHERRY, D. S.
Cycling of Elements in Duckweed (Lemna Perpusilla) in an Ash Settling Basin and Swamp Drainage System,
W79-01458 5C

CHERUBINI, A.
An Ecological Study of a Baldcypress Swamp in St. Charles Parish, Louisiana,
W79-01226 2L

CHESEBROUGH, E. W.
Quaboag and Quacumquasit Ponds, Water Quality Study, April 1974-April 1975,
W79-01202 5C

CHITTENDEN, M. E. JR.
Trends in the Abundance of American Shad, Alosa Sapidissima, in the Delaware River Basin,
W79-01322 5C

CHRISTENSEN, E. R.
Metals from Urban Runoff in Dated Sediments of a Very Shallow Estuary,
W79-01251 5A

CLARK, C. W.
Renewable Resource Management and Extinction,
W79-01495 6A

COFFIN, J. H.
Analysis of Water Flow Problems in the Hells Canyon of the Snake River,
W79-01359 4A

COLE, J. C.
Adjustable Height Sprinkler,
W79-01411 3F

COLLINS, J. W.
Removal of Soluble BOD sub 5 Primary Clarifiers,
W79-01317 5D

COLON, R.
Time Averaged Areal Mean of Precipitation: Estimation and Network Design,
W79-01357 2B

COMMON, M. S.
A Note on the Use of Taxes to Control Pollution,
W79-01496 5G

COOKE, A. S.
Shell Structure of Immature Roman Snails (Helix Pomatia) After Exposure to P,P'-DDT,
W79-01020 5C

COOLEY, J. M.
The Effect of Temperature on the Development of Diapausing and Subitaneous Eggs in Several Freshwater Copepods,
W79-01033 5C

CORTOPASSI, D. A.
Guidance Control System for Self-Propelled Mobile Sprinkler Irrigation Systems,
W79-01410 3F

COSNER, O. J.
Digital-Model Simulation of the Glacial-Outwash Aquifer, Otter Creek-Dry Creek Basin, Cortland County, New York,
W79-01377 2F

COSTA, J. E.
Colorado Big Thompson Flood: Geologic Evidence of a Rare Hydrologic Event,
W79-01047 2E

COURT, A.
Randomized Cloud Seeding in the San Juan Mountains, Colorado,
W79-01035 3B

COWARDIN, L. W.
Habitat Use and Home Range of Mallards Breeding in Minnesota,
W79-01287 2I

COX, J. A.
Donnan Dialysis Enrichment of Cations,
W79-01011 2K

Ion Exchange Membrane Methods for Continuous Removal of Ions from Water and Trace Chemical Analysis,
W79-01327 5A

CRAWFORD, N. H.
Modeling Pesticides and Nutrients on Agricultural Lands,
W79-01004 5B

CROLEY, T. E. II
Quantification of Recreational Use of the Coralville Reservoir,
W79-01361 6B

CSANADY, G. T.
Wind Effects on Surface to Bottom Fronts,
W79-01045 2L

DAIBER, F. C.
Nitrate and Nitrite in the Surface Waters of Two Delaware Salt Marshes,
W79-01291 5B

Primary Production of Edaphic Algal Communities in a Delaware Salt Marsh,
W79-01296 5C

Response in Production of Cord Grass, Spartina Alterniflora, to Inorganic Nitrogen and Phosphorus Fertilizer,
W79-01225 2L

DANEKE, G. A.
Public Involvement in Natural Resource Development: A Review of Water Resource Planning,
W79-01153 6B

DANIEL, T. C.
Guidelines for Mandatory Erosion Control Programs,
W79-01160 5G

DAVIS, G. H.
Self-Propelled Dredging Apparatus,
W79-01389 8C

DAVIS, N. W.
Abundance, Diversity, and Stability in Shore-Zone Fish Communities in an Area of Long Island Sound Affected by the Thermal Discharge of a Nuclear Power Station,
W79-01021 5C

DAY , J. B.
The Use of Inclined Boreholes for Well Development,
W79-01107 8B

DEACUTIS, C. F.
Effect of Thermal Shock on Predator Avoidance by Larvae of Two Fish Species,
W79-01454 5C

DEAN-RAYMOND, D.
Recovery of Nitrosamines from Water,
W79-01006 5D

DEANGELIS, P.
Apparatus for Removing Mercury from Waste Water,
W79-01408 5D

DEJU, R. A.
Transmissivity and Hydraulic Conductivity of Saturated Sedimentary Rocks in the Hanford Reservation,
W79-01053 8B

DELLEUR, J. W.
Geomorphologic Characteristics of Fourteen Indiana Watersheds Obtained from a Computer Data Bank of Stream Networks,
W79-01426 4D

DEMBO, M. M.
Crops-Wide Conference on Computer-Aided Design in Structural Engineering, Volume XI: Earthquake and Dynamic Analyses,
W79-01057 8G

DENISON, E. F.
Effects of Selected Changes in the Institutional and Human Environment Upon Output Per Unit of Input,
W79-01491 6B

DESTY, D. H.
Breakwater,
W79-01400 8A

DEVAUL, R. W.
Dissolved-Solids Concentrations of Water in the Niagara Aquifer, Wisconsin,
W79-01369 7C

Probable Yields of Wells in the Niagara Aquifer, Wisconsin,
W79-01367 7C

DICKEY, M. L.
Should the Law of the Sea Conference Be Saved,
W79-01157 6E

DIK, S. R.
Group 'B' Vitamins in Peat Soils and Excrement of Invertebrates,
W79-01302 2G

DILLARD, J. W.
Determination of the Complexing Capacity of Natural Water by Cobalt (III) Complexation,
W79-01345 5A

Evaluation of Micromolar Complexiметric Titrations for the Determination of the Complexing Capacity of Natural Waters,
W79-01344 5A

DILLON, M. A.
Irrigating Corn and Grain Sorghum with Limited Water,
W79-01425 3F

DINUNZIO, J. E.
Don in Dialysis Enrichment of Cations,
W79-01011 2K

DISALVO, L. H.
Toxicity and Mutagenicity of 2,4,6-Trinitrotoluene and Its Microbial Metabolites,
W79-01012 5C

DITTON, R. B.
An Alternative Perspective on Common Property Resource Allocation Decisions in the Coastal Zone,
W79-01494 6A

DIXON, P.
Use of Unicellular Algae for Evaluation of Potential Aquatic Contaminants,
W79-01476 5A

DOBOSY, R. J.
Role of Turbulent Mixing in the Dispersion of Pollutants at the Edge of a Large Lake,
W79-01199 5C

DODGE, W. E.
Stream Channelization Impacts on Songbirds and Small Mammals in Vermont,
W79-01431 6G

DOLAN, R.
Man's Impact on the Barrier Islands of North Carolina,
W79-01220 6G

DONALDSON, L. R.
Chronic Exposure of Chinook Salmon Eggs and Alevins to Gamma Irradiation: Effects on Their Return to Freshwater as Adults,
W79-01455 5C

DONIGIAN, A. S. JR.
Modeling Pesticides and Nutrients on Agricultural Lands,
W79-01004 5B

DONNELLY, R. G.
Treatment of Electroplating Wastes by Reverse Osmosis,
W79-01320 5D

DOORIS, P. M.
Effects of Chelated Iron on the Growth of Two Species of Vallisneria,
W79-01446 5C

DOUGHERTY, M. T.
Feasibility Study, Fly Ash Reclamation of Surface Mines, Hillman State Park, Feasibility Study,
W79-01323 5G

DOWNES, M. T.
An Improved Hydrazine Reduction Method for the Automated Determination of Low Nitrate Levels in Freshwater,
W79-01042 5A

DRECHSLER, H. D.
The Effect of Some Basic Statistical and Biological Principles on Water Pollution Control,
W79-01243 5G

DRUFFEL, L. A.
Dam-Break Flood Wave Computation by Method of Characteristics and Linearized Implicit Schemes,
W79-01274 8B

DU FRESNE, E. R.
System for Removal of Toxic Heavy Metals from Drinking Water,
W79-01393 5F

DUBEY, G. A.
Removal of Soluble BOD sub 5 Primary Clarifiers,
W79-01317 5D

DUCKERT, W.
State-of-the-Art: Military Explosives and Propellants Production Industry, Vol. III – Wastewater Treatment,
W79-01318 5D

DUCKWORTH, R.
Breakwater,
W79-01400 8A

DUNN, E. L.
Growth and Resource Allocation Responses of Spartina Alterniflora Loisel to Three Levels of NH sub 4-N, FE, and NACL in Solution Culture,
W79-01294 2I

DUNSON, W.
Exceptional Tolerance to Low pH of some Tropical Blackwater Fish,
W79-01098 5C

DYE, J. E.
The Relationship Between Radar Reflectivity Factor and Hail at the Ground for Northeast Colorado Thunderstorms,
W79-01037 7B

DYSART, J. E.
Dissolved-Solids Concentrations and Loads in Florida Surface Waters,
W79-01382 7C

ECKART, J. F.
The Effect of Dirunal Variation in Light and Temperature on the Acetylene Reduction Activity (N2 Fixation) of Subterranean Clover,
W79-01092 2I

EDWARDS, C. D.
Fluid Development for Drilling Sloughing and Heaving Shales,
W79-01104 8G

EFREMOV, S. P.
About the Afforestation of Bogs in Tomsk Region,
W79-01305 2H

EGANHOUSE, R. P.
Geochemistry of Mercury in Palos Verdes Sediments,
W79-01250 5B

EIBL, V.
Method of Purifying Water,
W79-01402 5F

ELLIOTT, R. D.
Randomized Cloud Seeding in the San Juan Mountains, Colorado,
W79-01035 3B

ELLIS, J. W.
Remote Sensing of Water Levels in Small-Diameter Wells,
W79-01101 7B

ELMENDORF, M.
Citizen Participation for Successful Village Water Supply,
W79-01112 6B

ENGEL, R.
Trace Metal Enhancement in the Biotic and Abiotic Components of an Estuarine Tidal Front,
W79-01046 5B

ERDMANN, D. E.
An Automated Procedure for the Simultaneous Determination of Specific Conductance and pH in Natural Water Samples,
W79-01374 2K

ERICKSON, L. E.
Synthesis of Optimal Feedback Control Systems for Fermentations and Biological Waste Treatment Processes,
W79-01428 5D

ESSERY, I. T. S.
Reaeration Performance of Stepped Cascades,
W79-01249 5G

ETZEL, J. E.
Method for Removing of Multivalent Heavy Metals from Metal Plating Waste Effluents,
W79-01415 5D

EWEL, K. C.
The Effect of Fire on Species Composition in Cypress Dome Ecosystems,
W79-01292 4C

FALES, R. R.
The Influence of Temperature and Salinity on the Toxicity of Hexavalent Chromium to the Grass Shrimp Palaemonetes Pugio (Holthuis),
W79-01457 5C

FAN, L. T.
Synthesis of Optimal Feedback Control Systems for Fermentations and Biological Waste Treatment Processes,
W79-01428 5D

FARHAR, B. C.
A Societal Assessment of the Proposed Sierra Snowpack Augmentation Project,
W79-01063 3B

FARMER, M.
Nitrogen and Phosphorus Behavior During Aerobic Digestion of Waste Activated Sludge,
W79-01003 5D

FAVER, D. E.
The National Energy Plan,
W79-01480 6B

FENICAL, W.
Polyhalogenated 1-Octene-3-Ones, Antibacterial Metabolites from the Red Seaweed Bonnemaisonia Asparagoides,
W79-01204 5C

FFOLLIOTT, P.
Characteristics of Arizona Ponderosa Pine Stands on Sandstone Soils,
W79-01099 2I

FILBY, J.
Purification of Water for Boiler,
W79-01405 5F

FINSTEIN, M. S.
Distribution of Autotrophic Nitrifying Bacteria in a Polluted River (the Passaic),
W79-01007 5B

FISCHER, H. B.
Mixing and Dispersion in Estuaries,
W79-01338 5B

FISCHER, W.
Water Sterilization Apparatus,
W79-01395 5F

FISHMAN, G. I.
Electrochemical Purification of Wastewaters, Containing Polyester Resin (Elektrokhimicheskaya oehistka stochnykh vod, soderzhashchikh poliefirnuyu smolu),
W79-01066 5D

FLEMER, D. A.
Standing Crops of Marsh Vegetation of Two Tributaries of Chesapeake Bay,
W79-01433 2L

FLETCHER, M. R.
Gull Droppings and Their Effects on Water Quality,
W79-01041 5B

FORD, R. S.
Well Logs...Are They Really Necessary,
W79-01119 7C

FOULQUIER, L.
Methods of Contamination of Two Freshwater Food Chains by Cobalt 60: I. Direct Contamination of the Organisms by the Water (Modalites de la Contamination de Deux Chaines Trophiques Dulcaquicoles par le Cobalt 60: I. Contamination Directe des Organismes par L'Eau),
W79-01442 5C

FRANCIS, A. J.
Recovery of Nitrosamines from Water,
W79-01006 5D

FRANZ, D. D.
Dam Break Flood Wave Analysis: Problems, Pitfalls, and Partial Solutions,
W79-01276 8B

FREAD, D. L.
The Development and Testing of a Dam-Break Flood Forecasting Model,
W79-01270 8B

FRENCH, J. E.
Effect of DDT and Polychlorinated Biphenyls on Cell Population Growth of Crithidia Fasciculata, A Flagellated Protozoan,
W79-01013 5C

FRITZ, R. G.
Economic Analysis of Alternative Sludge Disposal Methods in Vermont,
W79-01328 5E

FUKAI, T.
Oil Boom for Damming and Collecting a Floating Oil Slick,
W79-01394 5G

FUKUI, T.
Addition of Potato Protein Recovered from Potato Starch Factory Waste Effluents for Bread,
W79-01073 5E

GAD-EL-HAK, M.
Sand Transport Model of Barchan Dune Equilibrium,
W79-01043 2J

GAINES, L.
Effects of Chromium on Some Aquatic Plants,
W79-01031 5C

GALE, G. M.
Purification of Water by Reverse Osmosis Using a Supported Semi-Permeable Membrane,
W79-01414 5F

GALLAGHER, J. L.
Primary Production of Edaphic Algal Communities in a Delaware Salt Marsh,
W79-01296 5C

GAMBRELL, R. P.
Transformations of Heavy Metals and Plant Nutrients in Dredged Sediments as Affected by Oxidation Reduction Potential and pH, Volume II: Materials and Methods/Results and Discussion,
W79-01201 5C

GAMES, L. M.
On the Mechanisms of CO2 and CH4 Production in Natural Anaerobic Environments,
W79-01135 5C

GANJE, T. J.
Cadmium Availability to Rice in Sludge-Amended Soil Under 'Flood' and 'Nonflood' Culture,
W79-01127 5E

Growth and Cadmium Accumulation of Plants Grown on a Soil Treated with a Cadmium-Enriched Sewage Sludge,
W79-01282 5C

Yield and Cadmium Accumulation of Forage Species in Relation to Cadmium Content of Sludge-Amended Soil,
W79-01237 5C

GARDNER, D.
Dissolved Mercury in the Lake Windermere Catchment Area,
W79-01040 5B

GARRETT, P.
Conference Proceedings - A Critical Economic Balance, Water - Land - Energy - People - Held at Colorado State University, Pingree Park Campus on June 6-7, 1977,
W79-01478 6B

GARRETT, P. G.
Coordinated Energy Management,
W79-01479 6B

GARRISON, J. M.
Unsteady Flow Modeling of Dam-Break Waves,
W79-01268 8B

GASS, T. E.
The Impact of Hazardous Wastes on Ground Water: Part II,
W79-01113 5B

GAY, L. W.
An Energy Budget Analysis of Evapotranspiration from Saltcedar,
W79-01231 3B

GIBBONS, J. W.
Thermal Alterations of Aquatic Ecosystems,
W79-01284 5C

GIBBS, P. E.
Inland Mangroves and Water Chemistry, Barbuda, West Indies,
W79-01215 2K

GIBSON, R. J.
The Behavior of Juvenile Atlantic Salmon (Salmo Salar) and Brook Trout (Salvelinus Fontinalis) with Regard to Temperature and to Water Velocity,
W79-01441 5C

GILBERT, L. W.
A Probabilistic Analysis of Embankment Stability Problems,
W79-01054 8D

GILEAD, G.
Water Conduit,
W79-01390 3F

GILLIAM, J. W.
Drainage Control to Diminish Nitrate Loss from Agricultural Fields,
W79-01137 5G

GILMER, D. S.
Habitat Use and Home Range of Mallards Breeding in Minnesota,
W79-01287 2I

GLAESER, J. M.
Federal Common Law and Ocean Pollution: A Private Remedy for Oil Pollution Damage,
W79-01150 5G

GLASS, G. E.
Organic Contaminants,
W79-01471 5C

GLATER, J.
High-Temperature Solubilities of Calcium Sulfate Hemihydrate and Anhydrite in Natural Seawater Concentrates,
W79-01128 3A

GLEASON, V. E.
The Legalization of Groundwater Shortage,
W79-01142 6E

GODFREY, P. J.
Man's Impact on the Barrier Islands of North Carolina,
W79-01220 6G

GOLDBERGER, W. M.
An Assessment of Technology for Possible Utilization of Bayer Process Muds,
W79-01315 5D

GOLDEN, F. M.
Mixed-Bed Ion Exchange Desalting by the Calcium Hydroxide Process,
W79-01340 3A

GOLDEN, S. L.
Riparian Rights Under the Texas Water Rights Adjudication Act - A Constitution Analysis,
W79-01140 6E

GOLDSMITH, R. L.
Treatment of Electroplating Wastes by Reverse Osmosis,
W79-01320 5D

GOLDSTEIN, A. K.
Additions to the Freshwater Algae of South Carolina,
W79-01203 5C

GONZALES, A.
The Density of Seawater Solutions at One Atmosphere as a Function of Temperature and Salinity,
W79-01064 2K

GOOLSBY, D. A.
Dissolved-Solids Concentrations and Loads in Florida Surface Waters,
W79-01382 7C

GOTO, K.
Effect of Acid Mine Drainage on the pH of Lake Toya, Japan,
W79-01258 5B

GOULD, D. J.
Gull Droppings and Their Effects on Water Quality,
W79-01041 5B

GRANT, D. C.
Treatment of Electroplating Wastes by Reverse Osmosis,
W79-01320 5D

GRAY, W. G.
Analytic Solutions for Computer Flow Model Testing,
W79-01256 2L

GREEN, R. E.
Field Study of Solute Movement in a Highly Aggregated Oxisol with Intermittent Flooding: I. Nitrate,
W79-01360 3F

GREENE, N. D.
Removal of Metallic Impurities from Water by Electrochemical Methods,
W79-01121 5D

GRIFFICEN, W.
Mortalities of Pen-Reared Salmon Associated with Blooms of Marine Algae,
W79-01462 5C

GRIFFIN, D. B.
Treatment and Disposal of Complex Industrial Wastes,
W79-01321 5D

GRUBB, H. F.
Hydrogeologic Maps of a Flood Detention Area Proposed by Southwest Florida Water Management District Green Swamp Area, Florida,
W79-01383 7C

GUM, R. L.
Economic Value of Hunting, Fishing, and General Rural Outdoor Recreation,
W79-01430 6B

GUPTA, P. K.
Effect of Mercuric Chloride on the Digestive System of a Teleost Fish, Channa Punctatus,
W79-01019 5C

GUSTAVSON, T. C.
Bed Forms and Stratification Types of Modern Gravel Meander Lobes, Nueces River, Texas,
W79-01044 2J

GUTHRIE, L. G.
Crops-Wide Conference on Computer-Aided Design in Structural Engineering. Volume XI: Earthquake and Dynamic Analyses,
W79-01057 8G

GUTHRIE, R. K.
Cycling of Elements in Duckweed (Lemna Perpusilla) in an Ash Settling Basin and Swamp Drainage System,
W79-01458 5C

GWIN, R. E. JR.
Irrigating Corn and Grain Sorghum with Limited Water,
W79-01425 3F

HAASE, J.
Process for the Purification of Industrial Effluents,
W79-01396 5D

HAIL, P. L.
The Management of Groundwater Supplies,
W79-01117 4B

HAINES, B. L.
Growth and Resource Allocation Responses of Spartina Alterniflora Loisel to Three Levels of NH sub 4-N, FE, and NACL in Solution Culture,
W79-01294 2I

HALLENBECK, W. H.
Precision Analysis for Waterborne Chrysotile Asbestos by Transmission Electron Microscopy,
W79-01010 5A

HALMOVA, T.
Laboratory Investigation of Water Pollution by Organic Substances in Flax Wastes Delignification (Laboratorne sledovanie organickeho znecistenia vod pri delignifikacii lanovych odpadov),
W79-01085 5B

HAMILTON, D. H.
Standing Crops of Marsh Vegetation of Two Tributaries of Chesapeake Bay,
W79-01433 2L

HANCK, K. W.
Determination of the Complexing Capacity of Natural Water by Cobalt (III) Complexation,
W79-01345 5A

Evaluation of Micromolar Complexiметric Titrations for the Determination of the Complexing Capacity of Natural Waters,
W79-01344 5A

HANKS, R. J.
Corn and Alfalfa Production as Influenced by Irrigation and Salinity,
W79-01136 3C

HANN, R. W. JR.
Optimal Operation of Large Agricultural Watersheds with Water Quality Constraints,
W79-01355 4D

HANNAFORD, J. F.
Randomized Cloud Seeding in the San Juan Mountains, Colorado,
W79-01035 3B

HARDER, S. M.
Guidelines for Mandatory Erosion Control Programs,
W79-01160 5G

HARDING, D. J.
Low Turbulence Settling Tank,
W79-01409 5D

HARR, C. A.
Ground-Water Resources and Geology of Columbia County, Wisconsin,
W79-01384 2F

HARSH, J. F.
Digital-Model Simulation of the Glacial-Outwash Aquifer, Otter Creek-Dry Creek Basin, Cortland County, New York,
W79-01377 2F

HARTER, L. G.
A Bioassay Technique to Evaluate the Effect of Secondary Effluent on Algal Interactions in the Connecticut River,
W79-01089 5C

HARTMANN, L.
Method and Apparatus for the Biological Cleansing of Waste Water,
W79-01413 5D

HARVEY, G. R.
Metabolism of Polychlorinated Biphenyls by Marine Bacteria,
W79-01443 5C

HATTULA, M. L.
Total Mercury and Methyl Mercury Contents in Fish from Lake Paijanne,
W79-01028 5C

HAUSZ, W.
Energy Conservation: Is the Heat Storage Well the Key.,
W79-01228 4B

Heat Storage Wells Conserve Fuels,
W79-01230 4B

HAWKES, J. M.
Vested Rights to Develop Land: California's AVCO Decision and Legislative Responses,
W79-01148 6F

HAWKINS, R. H.
Salt Pickup by Overland Flow in the Price River Basin, Utah,
W79-01245 5B

HAYES, D. W.
Tidal Sampler,
W79-01388 7B

HAYES, J. M.
On the Mechanisms of CO2 and CH4 Production in Natural Anaerobic Environments,
W79-01135 5C

HEADY, E. O.
An Economic Evaluation of Cropland Use as a Control for Sediment Nonpoint Pollution,
W79-01498 5G

HEALY, K. A.
Characteristics of Incinerator Residue and the Effect of its Leachate on Groundwater Quality,
W79-01090 5B

HEATH, R. C.
Hydrologic Impact of Land Drainage on Estuaries,
W79-01385 4A

HEINLE, D. R.
Standing Crops of Marsh Vegetation of Two Tributaries of Chesapeake Bay,
W79-01433 2L

HEISS, H. W.
Drilling Large Diameter Wells: The Proof is in the Planning,
W79-01110 8B

Regional Geology Series: Part X,
W79-01115 2F

Using Large Diameters to Increase Well Storage,
W79-01109 8B

HELWEG, O. J.
A Nonstructural Approach to Control Salt Accumulation in Ground Water,
W79-01132 5B

Regional Ground-Water Management,
W79-01105 4B

HENNY, C. J.
Great Blue Herons Respond to Nesting Habitat Loss,
W79-01432 6G

HERBACH, E. G.
In Pursuit of Clean Oceans - A Review of the Marine Protection, Research, and Sanctuaries Act,
W79-01144 5G

HERMAN, L. J.
Effect of Long-Term Reduction and Diel Fluctuation in Dissolved Oxygen on Spawning of Black Crappie, Pomoxis Nigromaculatus,
W79-01440 5C

HERNANDEZ, J. W.
Underground Injection Program Set Under Safe Drinking Water Act,
W79-01154 5G

HERSHBERGER, W. K.
Chronic Exposure of Chinook Salmon Eggs and Alevins to Gamma Irradiation: Effects on Their Return to Freshwater as Adults,
W79-01455 5C

HERSON, A.
Trade Off Analysis in Environmental Decision-making: An Alternative to Weighted Decision Models,
W79-01242 6G

HERVEY, A.
Injurious Effect of Tap Water on Rooting of Cuttings of Bryophyllum Calycinum,
W79-01221 5C

HILLMAN, M. E. D.
Review of R & D on Water Hyacinth Utilization in the Philippine Republic,
W79-01470 4A

HILLMAN, R. E.
Abundance, Diversity, and Stability in Shore-Zone Fish Communities in an Area of Long Island Sound Affected by the Thermal Discharge of a Nuclear Power Station,
W79-01021 5C

HITES, R. A.
Organic Compounds in the Delaware River,
W79-01252 5B

HOEL, M.
Resource Extraction and Recycling with Environmental Costs,
W79-01492 6A

HOFCROFT, F. J.
Waste-Water Treatment System,
W79-01420 5D

HOLMSTROM, B. K.
Low-Flow Characteristics of Streams in the Rock-Fox River Basin, Wisconsin,
W79-01366 2E

HOLZEN, H. H.
Feasibility Study, Fly Ash Reclamation of Surface Mines, Hillman State Park, Feasibility Study,
W79-01323 5G

HOOPER, F. F.
The Influence of Colloidal Organic Matter on Iron and Iron-Phosphorus Cycling in an Acid Bog Lake,
W79-01219 5C

HOSZOWSKI, A.
Effect of Copper and Tri- and Hexavalent Chromium on the Work of an Activated Sludge,
W79-01079 5D

HOUGHTON, D. D.
Role of Turbulent Mixing in the Dispersion of Pollutants at the Edge of a Large Lake,
W79-01199 5C

HOUSTON, C. W.
Bio-regeneration of Hydrocarbon-Exhausted Activated Carbon.
W79-01093 5D

HOWARD, A. D.
Sand Transport Model of Barchan Dune Equilibrium,
W79-01043 2J

HOWE, E. D.
Solar-Assisted Distillation of Sea Water,
W79-01239 3A

Solar-Assisted Still with Vapor-Compression Option,
W79-01126 3A

HSU, I. C.
The Effect of Hydraulic Jump on the Performance of a Single-Stage Flash Evaporator,
W79-01238 3A

HSU, P. H.
Comparison of Iron (III) and Aluminum in Precipitation of Phosphate from Solution,
W79-01095 5D

HUFSCHMIDT, M. M.
Water Quality: Problems and Research Needs,
W79-01348 6B

HUGHES, G. H.
Runoff from Hydrologic Units in Florida,
W79-01368 7C

HULME, P. D.
Monthly Determinations of the Concentrations of Sodium, Potassium, Magnesium and Calcium in the Rain and Pools of the Silver Flowe National Nature Reserve.
W79-01212 2K

HUNSAKER, V. E.
Corn and Alfalfa Production as Influenced by Irrigation and Salinity,
W79-01136 3C

HUNTER, J. T.
Growth and Mortality of Littorina Irrorata Say in Three North Carolina Marshes,
W79-01289 2L

HUNTINGTON, S. W.
Simulation of Flood Waves in Channels,
W79-01060 2E

HUTTULA, M. I.
Chlorinated Hydrocarbons and Mercury in Aquatic Vascular Plants of Lake Paijanne, Finland,
W79-01029 5C

IKEDA, S.
A Dynamic Water Quality Model of Lake Biwa - A Simulation Study of the Lake Eutrophication,
W79-01475 5C

IKEDA, Y.
On the Pharmacological Effects of Diisopropylnaphthalene on Yellow-Tail (In Japanese),
W79-01450 5C

INOUE, Y.
Experimental Study on the Concentration Process of Trace Element Through a Food Chain from the Viewpoint of Nutrition Ecology,
W79-01461 5B

IVASHCHENKO, E. V.
Determination of the Bichromate Oxidizability of Sugar Factory Effluents (Opredelenie bikhromatnoy okislyaemosti stochnykh vod sakharnogo zavoda),
W79-01074 5A

IWATA, M.
Method of Treating Waste Water with Activated Sludge,
W79-01403 5D

JACK, W. L.
Annual Catchment Losses-A Practical Method,
W79-01248 2D

JANAIUNEN, J.
Total Mercury and Methyl Mercury Contents in Fish from Lake Paijanne,
W79-01028 5C

JANATUINEN, J.
Chlorinated Hydrocarbons and Mercury in Aquatic Vascular Plants of Lake Paijanne, Finland,
W79-01029 5C

JANZOW, E. F.
Induced Crystallization of Large Free Ice Crystals in Slowly Flowing Brine,
W79-01429 3A

JAWORSKI, N. A.
Limnological Characteristics of the Potomac Estury,
W79-01195 5C

JENKINS, C. R.
A Study for Improving the Aerobic-Media Trickling Filter for Wastewater Treatment,
W79-01123 5D

JENKINS, S. R.
The Effectiveness of Sand Filters for the Removal of Specific Viruses from Water Using Selected Cations as Filter Aids,
W79-01352 5D

JENNE, E. A.
The Availability of Sediment-Bound Cobalt, Silver, and Zinc to a Deposit-Feeding Clam,
W79-01468 5B

JOHNSON, C. C.
Trace Metal Enhancement in the Biotic and Abiotic Components of an Estuarine Tidal Front,
W79-01046 5B

JOHNSON, J. N.
Geochemistry of Mercury in Palos Verdes Sediments,
W79-01250 5B

JOHNSON, R.
Nitrogen and Phosphorus Fertilization of Aquatic Vascular Plants and Algae in Replicated Ponds. I. Initial Response to Fertilization,
W79-01224 5C

JOHNSON, W. R. III
A Study for Improving the Aerobic-Media Trickling Filter for Wastewater Treatment,
W79-01123 5D

JOLLEY, R. L.
Chloro-Organics in Surface Water Sources for Potable Water,
W79-01472 5B

JOWETT, P. E.
In Vitro Changes in the Activity of ATPases in the Gills of Carcinus Maenas Exposed to Various Concentrations of p,p'-DDT,
W79-01032 5C

JUSTICE, C.
Use of Unicellular Algae for Evaluation of Potential Aquatic Contaminants,
W79-01476 5A

JUUL, R. B.
A Biological Assessment of Fish and Benthic Populations Inhabiting a Kraft Mill Effluent Channel,
W79-01448 5C

KAISER, K. L. E.
Organic Contaminants,
W79-01471 5C

KALLQVIST, T.
The Toxic Effect of Copper on Algae and Rotifers from a Soda Lake (Lake Nakuru, East Africa),
W79-01459 5C

KANEHIRO, Y.
Field Study of Solute Movement in a Highly Aggregated Oxisol with Intermittent Flooding: I. Nitrate,
W79-01360 3F

KARR, J. R.
Water Resources and the Land-Water Interface,
W79-01295 6E

KATAGIRI, A.
Application of Packed Biopolar Cell to Electrolytic Treatment of Waste Waters, (In Japanese),
W79-01080 5D

KATOPODES, N.
Comparative Analysis of Routing Techniques for the Floodwave from a Ruptured Dam,
W79-01272 8B

KAUFFMAN, K.
Water -- Demand and Supply: Economic Impacts,
W79-01482 6B

KAWAMURA, S.
Effect of Acid Mine Drainage on the pH of Lake Toya, Japan,
W79-01258 5B

KAWASAKI, M.
Preparation of Copper Precipitate for Electrolytic Copper Recovery from Electroplating Industry Wastewater (Denki mekki kojo haisui kara no do no denkai kaishu o mokteki to shita do chinden no seisei hoho),
W79-01076 5D

KAZDA, J.
The Importance of Water for the Spread of Potentially Pathogenic Mycobacteria: II. Growth of Mycobacteria in Water Models, (In German),
W79-01259 5C

KEEFE, C. W.
Standing Crops of Marsh Vegetation of Two Tributaries of Chesapeake Bay,
W79-01433 2L

KEEFER, T. N.
Qualitative Comparison of Three Dam Break Routing Models,
W79-01273 8B

KEITH, J. E.
Energy and the Colorado River,
W79-01167 3E

KELKAR, D.
Geochemical Implications of Summer Monsonnal Rainwater Composition Over India,
W79-01039 2K

KELWAY, P. S.
Characteristics of Rainfall Conditions with Particular Reference to North East England,
W79-01247 2B

KENNARD, W. C.
Inland Wetland Definitions,
W79-01335 6E

KENNEDY, J. F.
Field Study of Sediment Transport Characteristics of the Mississippi River near Fox Island (RM 355-6) and Buzzard Island (RM 349-50),
W79-01065 2J

KENNEDY, O.
Mortalities of Pen-Reared Salmon Associated with Blooms of Marine Algae,
W79-01462 5C

KHALID, R. A.
Transformations of Heavy Metals and Plant Nutrients in Dredged Sediments as Affected by Oxidation Reduction Potential and pH, Volume II: Materials and Methods/Results and Discussion,
W79-01201 5C

KILDOW, J. T.
Building Public/Private Cooperation in the Coastal Zone,
W79-01145 6E

KIM, H. G.
Bioassays on Marine Organisms: Acute Toxicity Test of Mercury, Cadmium, and Copper to Arkshell, Anadara Broughtonii, from Jin-Dong Bay, and to Oyster, Crassostrea Gigas, from Kwangdo Bay, South Coast of Korea,
W79-01015 5C

KING, D.
Vested Rights to Develop Land: California's AVCO Decision and Legislative Responses,
W79-01148 6F

KING, G. A. M.
Applying a Chemical Modelling Technique to Ecological Problems,
W79-01444 5B

KIRBY-SMITH, W. W.
Suspension-Feeding Aquaculture Systems: Effects of Phytoplankton Concentration and Temperature on Growth of the Bay Scallop,
W79-01285 5C

KISSINGER, G.
Conference Proceedings - A Critical Economic Balance, Water - Land - Energy - People - Held at Colorado State University, Pingree Park Campus on June 6-7, 1977,
W79-01478 6B

KLEI, H. E.
Characteristics of Incinerator Residue and the Effect of its Leachate on Groundwater Quality,
W79-01090 5B

KLEIN, G.
Cyclic Performance of Layered Beds for Binary Ion Exchange,
W79-01339 3A

Mixed-Bed Ion Exchange Desalting by the Calcium Hydroxide Process,
W79-01340 3A

KLOTZ, R. L.
Dissolved Organic Carbon Fluxes in the Shetucket River of Eastern Connecticut, USA,
W79-01337 5C

KNIGHT, A. W.
Aspects of the Life History and Growth of Acroneuria (Calineuria) Californica in a Sierra Foothill Stream,
W79-01125 2I

Effects of Kelthane and Temperature on the Respiration of Crangon Franciscorum,
W79-01241 5C

KOBAYASHI, S.
Accumulation of Arsenic in Sediments of Lakes Treated with Sodium Arsenite,
W79-01253 5B

KOBAYASHI, Y.
Method of Treating Waste Water with Activated Sludge,
W79-01403 5D

KOENINGS, J. P.
The Influence of Colloidal Organic Matter on Iron and Iron-Phosphorus Cycling in an Acid Bog Lake,
W79-01219 5C

KOIDE, M.
Metals from Urban Runoff in Dated Sediments of a Very Shallow Estuary,
W79-01251 5A

KORTMANN, R. W.
A Chemical Budget of a Soft-Water Bog Lake: Benthic Contributions,
W79-01423 2H

KOZLOVSKAYA, L. S.
Interrelation Between Insect Larvae and Soil Microflora in Forest Bogs,
W79-01301 2G

Role of Excrement of Invertebrates in the Activation of Microflora of Marsh Peat Soils,
W79-01303 2G

KRAEUTER, J. N.
Biodeposition by Salt-Marsh Invertebrates,
W79-01288 5B

KRAMER, D.
Building Public/Private Cooperation in the Coastal Zone,
W79-01145 6E

KREYSA, G.
Fixed-Bed Electrolysis - A Process for Purifying Waste Water Contaminated with Metals (Festbettelektrolyse - ein Verfahren zur Reinigung metallhaltiger Abwasser),
W79-01081 5D

KUBICEK, D. A.
Proposed (Guideline Model) Coastal and Riverine Flood Plain Zoning Ordinance,
W79-01147 6F

KUERSTEINER, R. L.
In Pursuit of Clean Oceans - A Review of the Marine Protection, Research, and Sanctuaries Act,
W79-01144 5G

KUHNS, R. E.
Apollo County Park Wastewater Reclamation Project, Antelope Valley, California,
W79-01324 5D

KUNKEL, B. A.
Heat and Thrust Requirements of a Thermal Fog Dispersal System,
W79-01058 3B

KURTZ, J. E.
Great Blue Herons Respond to Nesting Habitat Loss,
W79-01432 6G

KUZNETSOV, G. I.
Tailings Cofferdams on Permafrost Foundations in Yakutskaya ASSR,
W79-01051 8D

LAIRD, A. D. K.
Investigation of Heat Transfer Coefficients of Working Fluids in Geothermal Power Cycles,
W79-01279 4B

Solar-Assisted Still with Vapor-Compression Option,
W79-01126 3A

LAPERRIERE, J.
A Preliminary Survey of the Zooplankton and Benthos of an Arctic Lake Near Prudhoe Bay, Alaska,
W79-01427 2H

LARSON, E.
Fluoride Removal from Potable Water Supplies,
W79-01351 5F

LASSETER, E. L. JR.
Up to Our Wastes in Wet Suits: The Federal Law on Water Pollution,
W79-01161 5G

LAUMYANSKAS, G. A.
Treatment of Wastewaters Generated in Electroplating Shops by Reverse Osmosis. (1. Concentration of Washing Waters from Nickel-Plating Processes) (Ochistka stokov gal'vanotsekhov metodom obratnogo osmosa (1. kontsentrirovanie promyvnkh vod nikelirovaniya),
W79-01077 5D

LEE, G. F.
Accumulation of Arsenic in Sediments of Lakes Treated with Sodium Arsenite,
W79-01253 5B

LEE, M. T.
Geomorphologic Characteristics of Fourteen Indiana Watersheds Obtained from a Computer Data Bank of Stream Networks,
W79-01426 4D

LEE, Y.
The Slope of Gran's Plot: A Useful Function in the Examination of Precipitation, the Water-Soluble Part of Airborne Particles, and Lake Water,
W79-01474 5A

LEFOR, M. W.
Inland Wetland Definitions,
W79-01335 6E

LEIBOVITZ, J.
Polarization at Membrane/Solution Interfaces,
W79-01342 3A

LEITCH, J. A.
Impact of Floods and Alternative Flood Control Measures on the Devils Lake Basin Economy,
W79-01122 6B

Non-Resident Hunters--Benefactors or Bad Men.
W79-01138 6B

LETTERMAN, R. D.
Impact of Mine Drainage on a Mountain Stream in Pennsylvania,
W79-01017 5C

LEWIN, J.
Persistent Blooms of Surf Diatoms Along the Northwest Coast,
W79-01200 5C

LEWIS, J. M.
Effect of Complexation by Natural Organic Ligands on the Toxicity of Copper to a Unicellular Alga, Monochrysis Lutheri,
W79-01449 5C

LIAO, P. B.
Ammonia Production Rate and its Application to Fish Culture System Planning and Design,
W79-01465 5C

LIN, J. D.
Drift Velocity of Surface Films Over Waves,
W79-01139 5B

LIST, R.
Acoustic Doppler Sounding of Falling Snow,
W79-01034 2C

LITTLER, M.
Calcification and Its Role Among the Macroalgae,
W79-01097 2I

LOE, B. R.
Estimation of Water Balance of Lower Sutlej Catchment Up to Bhakra Dam Site by Thornthwaite's Method,
W79-01257 4A

LOVELL, A. D.
Remote Sensing of Water Levels in Small-Diameter Wells,
W79-01101 7B

LOWE, G. W.
Unsteady Flow Modeling of Dam-Break Waves,
W79-01268 8B

LUOMA, S. N.
The Availability of Sediment-Bound Cobalt, Silver, and Zinc to a Deposit-Feeding Clam,
W79-01468 5B

LYNCH, D. R.
Analytic Solutions for Computer Flow Model Testing,
W79-01256 2L

LYNN, S.
Cation-Exchange Column Behavior in a Desalination Process with Regenerant Recovery,
W79-01280 3A

MACMILLAN, A. L.
Apparatus for Removing Mercury from Waste Water,
W79-01408 5D

MADISON, F. W.
Guidelines for Mandatory Erosion Control Programs,
W79-01160 5G

MAHALL, B. E.
The Ecotone Between Spartina Foliosa Trin. and Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay: II. Soil Water and Salinity,
W79-01218 2L

The Ecotone Between Spartina Foliosa Trin. and Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay: III. Soil Aeration and Tidal Immersion,
W79-01283 2L

The Ecotone Between Spartina Folisoa Trin. and Salicornia Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay, I. Biomass and Production,
W79-01217 2L

MAHLER, R. J.
Cadmium Availability to Rice in Sludge-Amended Soil Under 'Flood' and 'Nonflood' Culture,
W79-01127 5E

Growth and Cadmium Accumulation of Plants Grown on a Soil Treated with a Cadmium-Enriched Sewage Sludge,
W79-01282 5C

Yield and Cadmium Accumulation of Forage Species in Relation to Cadmium Content of Sludge-Amended Soil,
W79-01237 5C

MAITLEN, C. E.
Self-Propelled Dredging Apparatus,
W79-01389 8C

MAITLEN, R. E.
Self-Propelled Dredging Apparatus,
W79-01389 8C

MALL, L. P.
Pollution Studies of River Khan (Indore) India -- I. Biological Assessment of Pollution,
W79-01018 5A

MALONEY, F. E.
The Ordinary High Water Mark: Attempts at Settling an Unsettled Boundary Line,
W79-01009 6E

MANGES, H. L.
Effect of Beef-Feedlot-Lagoon Water on Soil Chemical Properties and Growth and Composition of Corn Forage,
W79-01290 5C

MANGI, J.
Effects of Chromium on Some Aquatic Plants,
W79-01031 5C

MANZI, J. J.
Additions to the Freshwater Algae of South Carolina,
W79-01203 5C

MARGOLF, C.
Coal Development and Reclamation - Planning and Conservation,
W79-01489 6B

MARSHALL, K. C.
Biological Control Agents of Sewage Bacteria in Marine Habitats,
W79-01027 5C

MARTENS, D. W.
Acute Toxicity at Three Primary Sewage Treatment Plants,
W79-01436 5C

MARTIN, D. F.
Effects of Chelated Iron on the Growth of Two Species of Vallisneria,
W79-01446 5C

MARTIN, W. E.
Economic Value of Hunting, Fishing, and General Rural Outdoor Recreation,
W79-01430 6B

MARTNER, B. E.
The Relationship Between Radar Reflectivity Factor and Hail at the Ground for Northeast Colorado Thunderstorms,
W79-01037 7B

MATSON, E. A.
Dissolved Organic Carbon Fluxes in the Shetucket River of Eastern Connecticut, USA,
W79-01337 5C

MATULEWICH, V. A.
Distribution of Autotrophic Nitrifying Bacteria in a Polluted River (the Passaic),
W79-01007 5B

MCBRIDE, L. J.
Nutrient Recovery from Farm Ponds: Hydroponic Plant Production and Other Means, a Review,
W79-01477 5C

MCCAFFERTY, W. P.
Pre-Management Assessment of Aquatic Macroinvertebrates in a Small, Sedimentary Drainage Area of the Maumee and Lake Erie Basin.
W79-01096 5C

MCCARTY, P. L.
Direct Injection of Reclaimed Water into an Aquifer,
W79-01108 5D

MCCLUNG, C. R.
Nitrogen Accretion, and the Nature and Possible Significance of N2 Fixation (Acetylene Reduction) in a Nova Scotian Spartina Alterniflora Stand,
W79-01214 5C

MCCONNEL, O. J.
Polyhalogenated 1-Octene-3-Ones, Antibacterial Metabolites from the Red Seaweed Bonnemaisonia Asparagoides,
W79-01204 5C

MCCUTCHAN, J. W.
Specification of Cellulose Acetate to be Used in Semipermeable Membranes,
W79-01129 3A

MCDONALD, D. B.
Coralville Water Quality Study Annual Report, Water Year October 1, 1975 to September 30, 1976,
W79-01473 5B

MCGARRY, M.
Citizen Participation for Successful Village Water Supply,
W79-01112 6B

MCNEAL, B. L.
Nitrogen and Irrigation Management to Reduce Return-Flow Pollution in the Columbia Basin,
W79-01001 5G

MCNULTY, K. J.
Treatment of Electroplating Wastes by Reverse Osmosis,
W79-01320 5D

MCWHORTER, J. C.
Relation of Water Absorption to Duration of Application in Furrow Irrigation,
W79-01094 3F

MEADOWS, B. S.
The Toxic Effect of Copper on Algae and Rotifers from a Soda Lake (Lake Nakuru, East Africa),
W79-01459 5C

MEKELBURG, M.
Critique of the Challenges,
W79-01486 6B

MELENT'EVA, N. D.
Electrochemical Purification of Wastewaters, Containing Polyester Resin (Elektrokhimicheskaya ochistka stochnykh vod, soderzhashchikh poliefirnuyu smolu),
W79-01066 5D

MELLANBY, K.
A Water Pollution Survey, Mainly by British School Children,
W79-01354 5G

MELLING, H.
Acoustic Doppler Sounding of Falling Snow,
W79-01034 2C

MENZEL, R. G.
Nutrient Recovery from Farm Ponds: Hydroponic Plant Production and Other Means, a Review,
W79-01477 5C

METZNER, H. E.
Computerized Costing Model for Inland Waterways Barge Transportation,
W79-01493 6A

MEYER, C. F.
Energy Conservation: Is the Heat Storage Well the Key.,
W79-01228 4B

MICHELSEN, E. R.
Quantitative Determination of Quaternary Ammonium Bases (QAB) in Water and Wastewater by Thin Layer Chromatography,
W79-01070 5A

MILLERO, F. J.
The Density of Seawater Solutions at One Atmosphere as a Function of Temperature and Salinity,
W79-01064 2K

MITCHELL, G. F.
The Dewatering of Lime-Algae Sludge on Sand Drying Beds,
W79-01349 5D

MITSCH, W. J.
The Effect of Fire on Species Composition in Cypress Dome Ecosystems,
W79-01292 4C

Impact of Mine Drainage on a Mountain Stream in Pennsylvania,
W79-01017 5C

MIURA, M.
Stochastic Modeling of Monthly and Daily Rainfall Sequences,
W79-01244 2B

MIZUMOTO, S.
Preparation of Copper Precipitate for Electrolytic Copper Recovery from Electroplating Industry Wastewater (Denki mekki kojo haisui kara no do no denkai kaishu o mokteki to shita do chinden no seisei hoho),
W79-01076 5D

MOHR, M. C.
Drift Velocity of Surface Films Over Waves,
W79-01139 5B

MONTZ, G. N.
An Ecological Study of a Baldcypress Swamp in St. Charles Parish, Louisiana,
W79-01226 2L

MOORE, J. N.
In Search of Common Nodules at UNCLOS III,
W79-01163 6E

MOORE, J. S.
State Approach to Groundwater Quality Protection: The Illinois Experience,
W79-01156 5G

MOORE, J. W.
Importance of Algae in the Diet of the Oligochetes Lumbriculus Variegatus (Muller) and Rhyacodrilus Sodalis (Eisten),
W79-01453 5C

MORAIN, E. W.
Adjustable Height Sprinkler,
W79-01411 3F

MORGAN, D.
Influence of Sediment in Copper Toxicity Tests with the Polychaete Neanthes Arenaceodentata,
W79-01460 5A

MORGAN, R. P. JR.
Chlorine effects on Larval Development of Striped Bass (Morone Saxatilis), White Perch (M. Americana) and Blueback Herring (Alosa Aestivalis),
W79-01456 5C

MORRIS, A. R.
Apparatus for Removing Mercury from Waste Water,
W79-01408 5D

MORRIS, J. S.
A Survey of the Freshwater Mussels (Bivalvia: Unionidae) of the Kanawha River of West Virginia,
W79-01435 5C

MORTON, J. B.
Sand Transport Model of Barchan Dune Equilibrium,
W79-01043 2J

MUELLER, H. F.
Fluoride Removal from Potable Water Supplies,
W79-01351 5F

MULLIGAN, H. F.
Nitrogen and Phosphorus Fertilization of Aquatic Vascular Plants and Algae in Replicated Ponds. I. Initial Response to Fertilization,
W79-01224 5C

MUNRO, G. R.
Renewable Resource Management and Extinction,
W79-01495 6A

MURAMATSU, T.
Oil Boom for Damming and Collecting a Floating Oil Slick,
W79-01394 5G

MURPHY, L. S.
Effect of Beef-Feedlot-Lagoon Water on Soil Chemical Properties and Growth and Composition of Corn Forage,
W79-01290 5C

MURRAY, J. P.
Kohl Spring - Biogeochemistry of a Blackwater System,
W79-01421 5B

MUSGROVE, C. A.
Water Contamination by Toxic Pollutants: An Assessment of Regulation,
W79-01174 6E

MYREEN, B.
Method and Device for Separation of Suspended Material from a Fluid Flow,
W79-01392 5D

NAKATO, T.
Field Study of Sediment Transport Characteristics of the Mississippi River near Fox Island (RM 355-6) and Buzzard Island (RM 349-50),
W79-01065 2J

NAWAFUNE, H.
Preparation of Copper Precipitate for Electrolytic Copper Recovery from Electroplating Industry Wastewater (Denki mekki kojo haisui kara no do no denkai kaishu o mokteki to shita do chinden no seisei hoho),
W79-01076 5D

NAWROCKI, M. A.
Removal and Separation of Spilled Hazardous Materials from Impoundment Bottoms,
W79-01307 5G

NEHER, M. A.
Heavy Metal Accumulation and its Effect on the Biota of an Industrial Settling Pond,
W79-01124 5D

NEMETZ, P. N.
The Effect of Some Basic Statistical and Biological Principles on Water Pollution Control,
W79-01243 5G

NEUFELD, M. N.
Market Input/Output Studies. Task I. Vinylidene Chloride,
W79-01500 6B

NEUFELD, R. D.
Differential Bed Kinetic Analysis of Heavy Metal Removals by Biological Slimes,
W79-01314 5D

NEWHOUSE, L.
Building Public/Private Cooperation in the Coastal Zone,
W79-01145 6E

NEWLIN, J.
Conference Proceedings - A Critical Economic Balance, Water - Land - Energy - People - Held at Colorado State University, Pingree Park Campus on June 6-7, 1977,
W79-01478 6B

NG, J.
Toxicity and Mutagenicity of 2,4,6-Trinitrotoluene and Its Microbial Metabolites,
W79-01012 5C

NICHOLS, W. L.
Uptake of Zinc by the Aquatic Larvae of Simulium Ornatipes (Diptera: Newatocera),
W79-01026 5C

NIIMI, A. J.
Lag Adjustment Between Estimated and Actual Physiological Responses Conducted in Flow-Through Systems,
W79-01445 5C

NIKAIDO, M. M.
Recovery of Nitrosamines from Water,
W79-01006 5D

NOBE, K.
Electrochemical Behavior of Rotating Iron Disks Effect of FE(111),
W79-01281 8G

Electrodissolution of Nickel in Molten LiCl-KCl,
W79-01234 8G

Hydrogen Evolution and Corrosion Behavior of Fe-Ni Alloys in H2SO4 - Effect of Temperature, Cl- and Benzatriazole,
W79-01235 8G

Polarization and Photopotentials of InSb in NaOH,
W79-01233 8G

Potentiodynamic Studies of Antimony in Acidic and Alkaline Solutions,
W79-01232 8G

NORDLUND, W.
Regional - Implications - Overview of National Energy Employment Relations,
W79-01483 6B

NOVITZKI, R. P.
Hydrology of the Nevin Wetland Near Madison, Wisconsin,
W79-01213 2H

NOWLAN, P. H.
Boring and Sampling Techniques,
W79-01103 8G

NYLUND, U.
Method and Device for Separation of Suspended Material from a Fluid Flow,
W79-01392 5D

NYQUIST, D.
A Preliminary Survey of the Zooplankton and Benthos of an Arctic Lake Near Prudhoe Bay, Alaska,
W79-01427 2H

ODUM, W. E.
Man's Impact on the Barrier Islands of North Carolina,
W79-01220 6G

OGLE, J.
The Feasibility of Suspension Culture of Oysters (Crassostrea Virginica) at a Petroleum Platform off the Texas Coast,
W79-01024 5C

OI, E.
Water Content Reduction of Metal-Plating Waste Sludge by a Press and Centrifuge (Mekki suraji no kokaiteki dassui ni kansuru kisoteki kenkyu),
W79-01082 5E

OKUM, D. A.
Principles for Water Quality Management,
W79-01165 5G

OTIS, J. L.
Review of R & D on Water Hyacinth Utilization in the Philippine Republic,
W79-01470 4A

OZAKI, H.
On the Pharmacological Effects of Diisopropylnaphthalene on Yellow-Tail (In Japanese),
W79-01450 5C

P'YAVCHENKO, N. I.
Some Results of Station Research on the Interrelation of Forest and Bog in Western Siberia,
W79-01298 2H

PAASIVIRTA, J.
Chlorinated Hydrocarbons and Mercury in Aquatic Vascular Plants of Lake Paijanne, Finland,
W79-01029 5C

PAGE, A. L.
Cadmium Availability to Rice in Sludge-Amended Soil Under 'Flood' and 'Nonflood' Culture,
W79-01127 5E

Growth and Cadmium Accumulation of Plants Grown on a Soil Treated with a Cadmium-Enriched Sewage Sludge,
W79-01282 5C

Yield and Cadmium Accumulation of Forage Species in Relation to Cadmium Content of Sludge-Amended Soil,
W79-01237 5C

PAGE, V. W.
Mixed-Bed Ion Exchange Desalting by the Calcium Hydroxide Process,
W79-01340 3A

PALLOTTI, B. L.
The Effect of Several Physical and Chemical Factors Upon the Distribution of Benthic Macroinvertebrates in Dunham Pond, Connecticut,
W79-01330 5C

PANKOW, J.
Effects of Chromium on Some Aquatic Plants,
W79-01031 5C

PAREKH, B. K.
An Assessment of Technology for Possible Utilization of Bayer Process Muds,
W79-01315 5D

PARK, J. S.
Bioassays on Marine Organisms: Acute Toxicity Test of Mercury, Cadmium, and Copper to Arkshell, Anadara Broughtonii, from Jin-Dong Bay, and to Oyster, Crassostrea Gigas, from Kwangdo Bay, South Coast of Korea,
W79-01015 5C

PARK, R. B.
The Ecotone Between Spartina Foliosa Trin. and Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay: II. Soil Water and Salinity,
W79-01218 2L

The Ecotone Between Spartina Foliosa Trin. and Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay: III. Soil Aeration and Tidal Immersion,
W79-01283 2L

The Ecotone Between Spartina Folisoa Trin. and Salicornia Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay, I. Biomass and Production,
W79-01217 2L

PARK, Y. A.
Distribution of Trace Metals and Sediments in Estuaries of the Kum River and the Mankyung River,
W79-01014 5B

PARKHOMETS, A. P.
Determination of the Bichromate Oxidizability of Sugar Factory Effluents (Opredelenie bikhromatnoy okislyaemosti stochnykh vod sakharnogo zavoda),
W79-01074 5A

PASSIVIRTA, J.
Total Mercury and Methyl Mercury Contents in Fish from Lake Paijanne,
W79-01028 5C

PATEL-MANDLIK, K.
Precision Analysis for Waterborne Chrysotile Asbestos by Transmission Electron Microscopy,
W79-01010 5A

PATRICK, W. H. JR.
Transformations of Heavy Metals and Plant Nutrients in Dredged Sediments as Affected by Oxidation Reduction Potential and pH, Volume II: Materials and Methods/Results and Discussion,
W79-01201 5C

PATRIQUIN, D. G.
Nitrogen Accretion, and the Nature and Possible Significance of N2 Fixation (Acetylene Reduction) in a Nova Scotian Spartina Alterniflora Stand,
W79-01214 5C

PATTERSON, J.
State-of-the-Art: Military Explosives and Propellants Production Industry, Vol. III - Wastewater Treatment,
W79-01318 5D

PATTERSON, R. E.
Polarization and Photopotentials of InSb in NaOH,
W79-01233 8G

PAUL, A. J.
Uptake and Release of Petroleum by Intertidal Sediments at Port Valdez, Alaska,
W79-01022 5B

PEDRICK, R. A.
Nonmetallic Elutriation and Sieving Device for Benthic Macrofauna,
W79-01447 5G

PENNAK, R. W.
Water Chemistry and the Reliability of Electronic Field Instruments,
W79-01333 5A

PERKEY, D. J.
Prediction of Convective Activity Using a System of Parasitic-Nested Numerical Models,
W79-01056 2B

PERKINS, L. Z.
Fish Ladder for Charles River Dam, Charles River, Massachusetts, Hydraulic Model Investigation,
W79-01052 8I

PERLAKY, C.
Methods and Compositions for Dispersing Oil Films,
W79-01407 5G

PERRY, H. D.
Controlling Erosion Along Highways with Vegetation or Other Protective Cover,
W79-01059 4D

PERSSON, N. Y.
Production and Dynamics of Experimentally Enriched Salt Marsh Vegetation: Belowground Biomass,
W79-01222 5C

PESCH, C. E.
Influence of Sediment in Copper Toxicity Tests with the Polychaete Neanthes Arenaceodentata,
W79-01460 5A

PEVZNER, I. D.
Electrochemical Purification of Wastewaters, Containing Polyester Resin (Elektrokhimicheskaya oehistka stochnykh vod, soderzhashchikh poliefirnuyu smolu),
W79-01066 5D

PHELPS, G. G.
Chemical Quality of Water Used for Municipal Supply in Florida, 1975,
W79-01375 7C

PIERCE, D. B.
Sand Transport Model of Barchan Dune Equilibrium,
W79-01043 2J

PIETERSE, A. J. H.
Observations on Algal Populations and Experimental Maturation Pond System,
W79-01196 5D

PIRIE, N. W.
Fresh-Water Weeds are a Resource,
W79-01197 5C

PIRON, D. L.
Electrodissolution of Nickel in Molten LiCl-KCl,
W79-01234 8G

PITT, W. W. JR.
Chloro-Organics in Surface Water Sources for Potable Water,
W79-01472 5B

PLATONOV, G. M.
The Shift of Bog Vegetation Under the Influence of Drying,
W79-01304 2H

PLOTKIN, M. J.
Market Input/Output Studies. Task I. Vinylidene Chloride,
W79-01500 6B

POLAND, J. F.
Land Subsidence in the Santa Clara Valley,
W79-01365 2F

POLLINGHER, U.
Quantitative and Qualitative Changes in the Phytoplankton of Lake Kinneret, Israel, 1972-1975,
W79-01198 5C

POLSON, J.
State-of-the-Art: Military Explosives and Propellants Production Industry, Vol. III -- Wastewater Treatment,
W79-01318 5D

PONCE, S. L.
Salt Pickup by Overland Flow in the Price River Basin, Utah,
W79-01245 5B

POPOVICH, L.
Tap Water and Timber - The Costs of Multiple Use,
W79-01166 5G

PORTER, G. H.
Implementing 'Best Management Practices' for Residuals: The Waste Exchange,
W79-01309 5G

POSSARDT, E. E.
Stream Channelization Impacts on Songbirds and Small Mammals in Vermont,
W79-01431 6G

POST, F. J.
The Microbial Ecology of the Great Salt Lake North Arm,
W79-01346 5C

POST, J.
The MicroBial Ecology of the Great Salt Lake,
W79-01347 5C

POUGH, F. H.
Can Salamanders and Frogs Survive the Threat of Acid Precipitation,
W79-01005 5C

POWER, G.
The Fox in the Chicken Coop: The Regulatory Program of the U.S. Army Corps of Engineers,
W79-01141 6E

POWERS, W. L.
Effect of Beef-Feedlot-Lagoon Water on Soil Chemical Properties and Growth and Composition of Corn Forage,
W79-01290 5C

PRATT, P. F.
Effect of Soil Application of Dairy Manure on Germination and Emergence of Some Selected Crops,
W79-01236 5C

PRICE, J. T.
Unsteady Flow Modeling of Dam-Break Waves,
W79-01268 8B

PRICE, M.
The Use of Inclined Boreholes for Well Development,
W79-01107 8B

PRINCE, R. D.
Chlorine effects on Larval Development of Striped Bass (Morone Saxatilis), White Perch (M. Americana) and Blueback Herring (Alosa Aestivalis),
W79-01456 5C

PUIU, M.
Investigations of the Decoloration of Wastewaters Generated in Confier Sulfate Pulp Mills (Cercetari privind decolorarea apelor reziduale provenite de la fabricarea celulozei sulfat din rasinoase),
W79-01084 5D

QUENET, L.
The Expanding Geysers,
W79-01116 4B

QUINN, J. G.
Fatty Acid Composition of Organic Detritus from Spartina Alterniflora,
W79-01332 5C

RAAB, G.
Method for Sequestering Metal Ions,
W79-01417 5G

RAMIREZ ROJAS, A. J.
Geochemistry of Mine Effluents in the Front Range Mineral Belt of Colorado,
W79-01363 5A

RAMSEIER, R. O.
Microwave Remote Sensing of Sea Ice in the Aidjex Main Experiment,
W79-01386 2C

RAMSEYER, J. B.
Microwave Remote Sensing of Sea Ice in the Aidjex Main Experiment,
W79-01386 2C

RAO, P. S. C.
Field Study of Solute Movement in a Highly Aggregated Oxisol with Intermittent Flooding: I. Nitrate,
W79-01360 3F

RAO, S. V. R.
Pollution Studies of River Khan (Indore) India -- I. Biological Assessment of Pollution,
W79-01018 5A

RASARATNAM, S. K.
Reaeration Performance of Stepped Cascades,
W79-01249 5G

RAY, S. M.
The Feasibility of Suspension Culture of Oysters (Crassostrea Virginica) at a Petroleum Platform off the Texas Coast,
W79-01024 5C

REDMOND, H. J.
Effect of Failure of the Old River Control Structure on Municipal and Industrial Water Supplies,
W79-01336 4A

REISCH, M. E. A.
Water Contamination by Toxic Pollutants: An Assessment of Regulation,
W79-01174 6E

RHEAD, M. M.
In Vitro Changes in the Activity of ATPases in the Gills of Carcinus Maenas Exposed to Various Concentrations of p,p'-DDT,
W79-01032 5C

RICHARDSON, C.
Generation of Daily Precipitation Over an Area,
W79-01261 2B

RICHERT, K. D.
A Numerical Model for Multidimensional Unconstrained Flow Over Irregular Terrain,
W79-01275 8B

RIECHMANN, J. H.
Habitat Use and Home Range of Mallards Breeding in Minnesota,
W79-01287 2I

RIELEY, J. O.
Relationships Between Mineral Supply and Growth of Narthecium Ossifragum (L.) Huds. on Mire Ecosystems,
W79-01216 2H

RIES, A.
Method of Purifying Water,
W79-01402 5F

RIGHTMIRE, C. T.
Seasonal Variation in Pco2 and C-13 Content of Soil Atmosphere,
W79-01387 2F

RINKLE, R.
A Societal Assessment of the Proposed Sierra Snowpack Augmentation Project,
W79-01063 3B

RO, C. U.
Correlations Between Maximum Rate of Precipitation and Mesoscale Parameters,
W79-01036 2B

ROBBINS, W. J.
Injurious Effect of Tap Water on Rooting of Cuttings of Bryophyllum Calycinum,
W79-01221 5C

ROBERTS, J. F.
Effect of DDT and Polychlorinated Biphenyls on Cell Population Growth of Crithidia Fasiculata, A Flagellated Protozoan,
W79-01013 5C

ROBERTS, P. V.
Direct Injection of Reclaimed Water into an Aquifer,
W79-01108 5D

RODGERS, J. H. JR.
Cycling of Elements in Duckweed (Lemna Perpusilla) in an Ash Settling Basin and Swamp Drainage System,
W79-01458 5C

ROGERS, D. C.
A Simulation of the Hydraulic Events During and Following the Teton Dam Failure,
W79-01269 8B

ROLFE, G. L.
Nutrient Fluxes in Precipitation, Throughfall, and Stemflow in an Oak-Hickory Forest,
W79-01246 2I

ROMAN, W. M.
Direct Injection of Reclaimed Water into an Aquifer,
W79-01108 5D

ROOS, A.
Total Mercury and Methyl Mercury Contents in Fish from Lake Paijanne,
W79-01028 5C

ROPER, M. M.
Biological Control Agents of Sewage Bacteria in Marine Habitats,
W79-01027 5C

ROPER, R. E.
Evaluation of Activated Sludge Hydraulic Control Techniques through Pilot Plant Analyses,
W79-01325 5D

ROWE, K.
The Use of Inclined Boreholes for Well Development,
W79-01107 8B

RUCKER, M. L.
Implementing 'Best Management Practices' for Residuals: The Waste Exchange,
W79-01309 5G

RUFFER, H.
Sewage from the Yeast Industry: Its Nature and Its Purification (Abwasser der Hefeindustrie, Beschaffenheit und Reinigung),
W79-01075 5D

RUGGLES, C.
Mud and Clay,
W79-01120 8G

RUTLEDGE, A. T.
Hydrogeologic Maps of a Flood Detention Area Proposed by Southwest Florida Water Management District Green Swamp Area, Florida,
W79-01383 7C

RYKIEL, E. J. JR.
The Okefenokee Swamp Watershed: Water Balance and Nutrient Budgets,
W79-01211 2H

SAGE, W. W.
Distribution of Bluegreen Algae in a Mississippi Gulf Coast Salt Marsh,
W79-01356 5B

SALDICK, J.
Oxidation-Reduction Chemistry And Aqueous Ammonium Oxidation in the Estimation of Nitrate by the Cadmium Reduction Method,
W79-01100 5B

SALLO, F. W. JR.
Fluoride Removal from Potable Water Supplies,
W79-01351 5F

SAMMIS, T. W.
An Energy Budget Analysis of Evapotranspiration from Saltcedar,
W79-01231 3B

SARKKA, J.
Chlorinated Hydrocarbons and Mercury in Aquatic Vascular Plants of Lake Paijanne, Finland,
W79-01029 5C

Total Mercury and Methyl Mercury Contents in Fish from Lake Paijanne,
W79-01028 5C

SASTRY, K. V.
Effect of Mercuric Chloride on the Digestive System of a Teleost Fish, Channa Punctatus,
W79-01019 5C

SCHAMBER, D.
Comparative Analysis of Routing Techniques for the Floodwave from a Ruptured Dam,
W79-01272 8B

SCHERFIG, J.
Metals from Urban Runoff in Dated Sediments of a Very Shallow Estuary,
W79-01251 5A

Use of Unicellular Algae for Evaluation of Potential Aquatic Contaminants,
W79-01476 5A

SCHIMMEL, C.
Treatment and Disposal of Complex Industrial Wastes,
W79-01321 5D

SCHLOSSER, I. J.
Water Resources and the Land-Water Interface,
W79-01295 6E

SCHMIDT, J. C.
Algaecidal Composition,
W79-01401 5F

SCHMIDT, K.
Effects of Chromium on Some Aquatic Plants,
W79-01031 5C

SCHNIDMAN, F.
Indians and the Environment: An Examination of Jurisdictional Issues Relative to Environmental Management,
W79-01143 6E

SCHOENBAUM, T. J.
Coastal Planning: The Designation and Management of Areas of Critical Environmental Concern,
W79-01152 5G

SCHULTZ, D. M.
Fatty Acid Composition of Organic Detritus from Spartina Alterniflora,
W79-01332 5C

SCHWARTZ, J.
High-Temperature Solubilities of Calcium Sulfate Hemihydrate and Anhydrite in Natural Seawater Concentrates,
W79-01128 3A

SCOTT, B. C.
Parameterization of Sulfate Removal by Precipitation,
W79-01038 5B

SCOTT, D. F.
Impact of Floods and Alternative Flood Control Measures on the Devils Lake Basin Economy,
W79-01122 6B

SCREPETIS, A. J.
Quaboag and Quacumquasit Ponds, Water Quality Study, April 1974-April 1975,
W79-01202 5C

SEITZ, W. D.
Soil Erosion Control Policies - Institutional Alternatives and Costs,
W79-01164 5G

SELVALINGAM, S.
Stochastic Modeling of Monthly and Daily Rainfall Sequences,
W79-01244 2B

SEMMENS, M. J.
Water Purification Process,
W79-01404 5D

SENECAL, P. F.
The Water Factor in the Social History of Honolulu, Hawaii,
W79-01353 6B

SEPHTON, H. H.
Renovation of Industrial Inorganic Wastewater by Evaporation with Interface Enhancement,
W79-01319 5D

SEQUEIRA, R.
Geochemical Implications of Summer Monsonnal Rainwater Composition Over India,
W79-01039 2K

SERVIZI, J. A.
Acute Toxicity at Three Primary Sewage Treatment Plants,
W79-01436 5C

SEYMOUR, D. E.
Algaecidal Composition,
W79-01401 5F

SEYMOUR, J. L.
An Alternative Perspective on Common Property Resource Allocation Decisions in the Coastal Zone,
W79-01494 6A

SHAFFER, R. W.
Randomized Cloud Seeding in the San Juan Mountains, Colorado,
W79-01035 3B

SHAH, P. S.
Synthesis of Optimal Feedback Control Systems for Fermentations and Biological Waste Treatment Processes,
W79-01428 5D

SHAPIRA, N. I.
State-of-the-Art: Military Explosives and Propellants Production Industry, Vol. III – Wastewater Treatment,
W79-01318 5D

SHARITZ, R. R.
Thermal Alterations of Aquatic Ecosystems,
W79-01284 5C

SHARMA, B.
Oxidation-Reduction Chemistry And Aqueous Ammonium Oxidation in the Estimation of Nitrate by the Cadmium Reduction Method,
W79-01100 5B

SHARMA, M. N.
Apparatus for Use in Water Purification Particularly Sewage Treatments,
W79-01418 5D

SHARP, J. W.
Effects of Kelthane and Temperature on the Respiration of Crangon Franciscorum,
W79-01241 5C

SHARPLESS, R.
Effect of Soil Application of Dairy Manure on Germination and Emergence of Some Selected Crops,
W79-01236 5C

SHAW, D. G.
Hydrocarbons in the Marine Environment of Port Valdex, Alaska,
W79-01254 5B

Uptake and Release of Petroleum by Intertidal Sediments at Port Valdez, Alaska,
W79-01022 5B

SHELDON, L. S.
Organic Compounds in the Delaware River,
W79-01252 5B

SHEYNFELDT, G. M.
Organization of Full-Scale Analyses of Filtration-Thermal Regime of Tailings Dams on Permafrost Foundations,
W79-01050 8D

SHILLINGLAW, S. N.
Observations on Algal Populations and Experimental Maturation Pond System,
W79-01196 5D

SHIREMAN, J. V.
A Biological Assessment of Fish and Benthic Populations Inhabiting a Kraft Mill Effluent Channel,
W79-01448 5C

SICK, L. V.
Trace Metal Enhancement in the Biotic and Abiotic Components of an Estuarine Tidal Front,
W79-01046 5B

SIEGFRIED, C. A.
Aspects of the Life History and Growth of Acroneuria (Calineuria) Californica in a Sierra Foothill Stream,
W79-01125 2I

SIGNOR, D. C.
Gas-Driven Pump for Ground-Water Supplies,
W79-01378 8C

SILLIMAN, K. G.
Coastal Planning: The Designation and Management of Areas of Critical Environmental Concern,
W79-01152 5G

SILVER, J. L. F.
Problems in Attempting to Translate Statutory Standards into Emission Limitations Under Air and Water Pollution Control Legislation,
W79-01151 5G

SILVESTRI, M.
Exceptional Tolerance to Low pH of some Tropical Blackwater Fish,
W79-01098 5C

SIMONS, R. K.
Qualitative Comparison of Three Dam Break Routing Models,
W79-01273 8B

SIMS, W. A.
The Response of Firms to Pollution Charges,
W79-01499 5G

SINGER, M. J.
Effect of Mulching on Sediment in Runoff from Simulated Rainfall,
W79-01130 4D

Evaluation of Wild Oat Straw as a Soil Erosion Retardant Using Simulated Rainfall,
W79-01131 4D

SINGH, V. P.
Pollution Studies of River Khan (Indore) India -- I. Biological Assessment of Pollution,
W79-01018 5A

SINKOVIC, J.
Polarization at Membrane/Solution Interfaces,
W79-01342 3A

SITTENFIELD, M.
Market Input/Output Studies. Task I. Vinylidene Chloride,
W79-01500 6B

SITTS, R. M.
Effects of Kelthane and Temperature on the Respiration of Crangon Franciscorum,
W79-01241 5C

SKAGGS, R. W.
Drainage Control to Diminish Nitrate Loss from Agricultural Fields,
W79-01137 5G

SLACK, L. J.
Program for Monitoring Surface-Water Quality in Florida,
W79-01376 7C

SLAUGHTER, G. M.
Evaluation of Design Methods of Subsurface Drainage Facilities for Highways,
W79-01061 4C

SMITH, M. A.
Pollution Abatement Facilities at National Fish Hatcheries,
W79-01463 5G

SMITH, M. L.
Computerized Costing Model for Inland Waterways Barge Transportation,
W79-01493 6A

SMITH, P. M.
Fish Ladder for Charles River Dam, Charles River, Massachusetts, Hydraulic Model Investigation,
W79-01052 8I

SNUKISHKIS, Y. Y.
Treatment of Wastewaters Generated in Electroplating Shops by Reverse Osmosis. (1. Concentration of Washing Waters from Nickel-Plating Processes) (Ochistka stokov gal'vanotsekhov metodom obratnogo osmosa (1. kontsentrirovanie promyvnkh vod nikelirovaniya),
W79-01077 5D

SNYDER, F. F.
Floods from Breaching of Dams,
W79-01267 8B

SOMMER, K.
Method for Sequestering Metal Ions,
W79-01417 5G

SOPPER, W. E.
Wastewater Recycling on Forest Lands,
W79-01424 5D

SOROKIN, A. I.
Determination of the Bichromate Oxidizability of Sugar Factory Effluents (Opredelenie bikhromatnoy okislyaemosti stochnykh vod sakharnogo zavoda),
W79-01074 5A

SOUZA, S. J.
The Effects of Land Use on Phosphorus Loading: A Case Study - Six Mile Run Reservoir,
W79-01086 5C

SOWLES, J. W.
Nitrogen Fertilization of Ponds,
W79-01439 5C

SPIEGLER, K. S.
Polarization at Membrane/Solution Interfaces,
W79-01342 3A

The Role of Membrane Methods in the Desalination of Brackish Water,
W79-01343 3A

SPITZE, R. G.
Soil Erosion Control Policies - Institutional Alternatives and Costs,
W79-01164 5G

SPRING, J. D.
Characteristics of Small Mammal Populations in Forested and Old Field Habitats Prior to Effluent Spray Irrigation,
W79-01331 5C

SPRINGER, P. F.
Changes in Submerged Aquatic Macrophyte Populations at the Head of Chesapeake Bay, 1958-1975,
W79-01030 5C

SRIVASTAVA, K. K.
Estimation of Water Balance of Lower Sutlej Catchment Up to Bhakra Dam Site by Thornthwaite's Method,
W79-01257 4A

ST, J. C.
Multiple Effect Evaporation of Water from Water Containing Combustible Sludges,
W79-01398 5E

STALTER, R.
Transplantation of Salt Marsh Vegetation. II. Georgetown, South Carolina,
W79-01306 2L

STAVER, A. W.
A Comparison of Bethlehem Steel Corp V. Train with Republic Steel Corp. V. Train: The Sixth Circuit,
W79-01162 5G

STEENIS, J.
Changes in Submerged Aquatic Macrophyte Populations at the Head of Chesapeake Bay, 1958-1975,
W79-01030 5C

STEIN, R.
Seabed Resources and International Law,
W79-01158 6E

STEINER, C.
Regional Water Supply Capacity Expansion with Seasonal Demands and Energy Costs,
W79-01002 6A

STEWART, R. K.
Water Quality Investigation Related to Seafood Processing Wastewater Discharges at Dutch Harbor, Alaska, October 1975, October 1976,
W79-01469 5C

STIVEN, A. E.
Growth and Mortality of Littorina Irrorata Say in Three North Carolina Marshes,
W79-01289 2L

STODDART, D. R.
Inland Mangroves and Water Chemistry, Barbuda, West Indies,
W79-01215 2K

STONE, L. R.
Irrigating Corn and Grain Sorghum with Limited Water,
W79-01425 3F

STONER, J. D.
Water-Quality Indices for Specific Water Uses,
W79-01381 5G

STOREY, D. J.
The 'Standards and Price' Approach to Pollution Control: Problems of Iteration,
W79-01497 5G

STOTTS, V. D.
Changes in Submerged Aquatic Macrophyte Populations at the Head of Chesapeake Bay, 1958-1975,
W79-01030 5C

STRACHAN, W. M. I.
Organic Contaminants,
W79-01471 5C

STRELKOFF, T.
Comparative Analysis of Routing Techniques for the Floodwave from a Ruptured Dam,
W79-01272 8B

STURGES, D.
The Industry's Role in Energy Management,
W79-01484 6B

SU, S. T.
Unsteady Flow Analysis of Dam-Break Waves,
W79-01264 8B

SULLIVAN, M. J.
Response in Production of Cord Grass, Spartina Alterniflora, to Inorganic Nitrogen and Phosphorus Fertilizer,
W79-01225 2L

SULLIVAN, T. E.
Corn and Alfalfa Production as Influenced by Irrigation and Salinity,
W79-01136 3C

SUMMERFIELD, R. J.
Relationships Between Mineral Supply and Growth of Narthecium Ossifragum (L.) Huds. on Mire Ecosystems,
W79-01216 2H

SUMMERS, W. K.
Transmissivity and Hydraulic Conductivity of Saturated Sedimentary Rocks in the Hanford Reservation,
W79-01053 8B

SUNDA, W. G.
Effect of Complexation by Natural Organic Ligands on the Toxicity of Copper to a Unicellular Alga, Monochrysis Lutheri,
W79-01449 5C

SUNDSTROM, D. W.
Characteristics of Incinerator Residue and the Effect of its Leachate on Groundwater Quality,
W79-01090 5B

SUZUKI, S.
Photo-Decomposition of Aqueous Solutions of Phenol (Fenooru suiyoeki no hikari bunkai),
W79-01069 5D

SWANSON, G. C.
An Alternative Perspective on Common Property Resource Allocation Decisions in the Coastal Zone,
W79-01494 6A

SWARTS, F.
Exceptional Tolerance to Low pH of some Tropical Blackwater Fish,
W79-01098 5C

SWEET, B. G.
A Water Well Evaluation System,
W79-01102 8B

TAIGANIDES, E. P.
Automated Treatment and Recycle of Swine Feedlot Wastewaters,
W79-01316 5D

TAKAHASHI, H.
Oil Boom for Damming and Collecting a Floating Oil Slick,
W79-01394 5G

TAKESHITA, H.
Effluent Oil Collecting Vessel,
W79-01419 5G

TALLIS, J. H.
The Response of *Empetrum Nigrum L.* to Different Mire Water Regimes, with Special Reference to Wybunbury Moss, Cheshire and Feather*bed Moss, Derbyshire*,
W79-01293 5C

TAN, K. H.
Highway Construction Impact on Water-Supply Lakes,
W79-01260 4C

TAN, M.
Treatment of Electroplating Wastes by Reverse Osmosis,
W79-01320 5D

TANEMURA, T.
Effect of Acid Mine Drainage on the pH of Lake Toya, Japan,
W79-01258 5B

TANGARENE, D. R.
Water Quality Investigation Related to Seafood Processing Wastewater Discharges at Dutch Harbor, Alaska, October 1975, October 1976,
W79-01469 5C

TARNAY, D. S.
Simplified Routing through Reservoir,
W79-01266 4A

TATE, T. K.
The Use of Inclined Boreholes for Well Development,
W79-01107 8B

TAYLOR, H. E.
An Automated Procedure for the Simultaneous Determination of Specific Conductance and pH in Natural Water Samples,
W79-01374 2K

TAYLOR, R. W.
A Survey of the Freshwater Mussels (Bivalvia: *Unionidae) of the Kanawha River of West Virginia*,
W79-01435 5C

TEAL, J. M.
Production and Dynamics of Experimentally Enriched Salt Marsh Vegetation: Belowground Biomass,
W79-01222 5C

TEBBUTT, T. H. Y.
Reaeration Performance of Stepped Cascades,
W79-01249 5G

TELEKI, G. C.
Acute Effects of Underwater Construction Blasting on Fishes in Long Point Bay, Lake Erie,
W79-01452 5C

TERRY, R. E.
Carbon and Nitrogen Transformations in Soils Amended with Sewage Sludge,
W79-01350 5C

TESTER, J. R.
Habitat Use and Home Range of Mallards Breeding in Minnesota,
W79-01287 2I

THIRUMURTHI, D.
Highway Construction Impact on Water-Supply Lakes,
W79-01260 4C

THOMAS, A. W.
Remote Sensing of Water Levels in Small-Diameter Wells,
W79-01101 7B

THOMAS, W. A.
Calculating and Routing the Teton Dam-Break Flood,
W79-01271 8B

THOMPSON, G. M.
Trichlorofluoromethane, a New Hydrologic Tool for Tracing and Dating Ground Water,
W79-01422 2F

TLEIMAT, B. W.
Investigation of Heat Transfer Coefficients of Working Fluids in Geothermal Power Cycles,
W79-01279 4B

Solar-Assisted Distillation of Sea Water,
W79-01239 3A

Solar-Assisted Still with Vapor-Compression Option,
W79-01126 3A

TOBIAS, R. F.
Electrochemical Behavior of Rotating Iron Disks Effect of FE(111),
W79-01281 8G

TOMLINSON, R. W.
Monthly Determinations of the Concentrations of Sodium, Potassium, Magnesium and Calcium in the Rain and Pools of the Silver Flowe National Nature Reserve.
W79-01212 2K

TONKYN, R. G.
Cationic Chlorine-Resistant Polymeric Flocculants and Their Use,
W79-01406 5D

TORRES, J. P.
Method of Treatment of an Oxidizable Material by a Biochemical Process,
W79-01412 5D

TRAINOR, F. R.
A Bioassay Technique to Evaluate the Effect of Secondary Effluent on Algal Interactions in the Connecticut River,
W79-01089 5C

TROTTA, L. C.
Ground-Water Resources and Geology of Columbia County, Wisconsin,
W79-01384 2F

TURCHEVICI, R.
Investigations of the Decoloration of Wastewaters Generated in Confier Sulfate Pulp Mills (Cercetari privind decolorarea apelor reziduale provenite de la fabricarea celulozei sulfat din rasinoase),
W79-01084 5D

TURNER, P.
Effects of Chromium on Some Aquatic Plants,
W79-01031 5C

TWILLEY, R. R.
Phosphorus Cycling in Nuphar luteum Communities in the Lower Chowan River, North Carolina,
W79-01326 5C

UCHIDA, S.
Effluent Oil Collecting Vessel,
W79-01419 5G

UKHOVA, N. V.
Approximate Calculation of Nonstationary Temperature Regime of a Rock-Ice Dam.
W79-01049 8D

VALIELA, I.
Production and Dynamics of Experimentally Enriched Salt Marsh Vegetation: Belowground Biomass,
W79-01222 5C

VALLERA, R.
Critique and Challenges,
W79-01490 6B

VANT, M. R.
Microwave Remote Sensing of Sea Ice in the Aidjex Main Experiment,
W79-01386 2C

VAUGHN, R. H.
Self-Propelled Dredging Apparatus,
W79-01389 8C

VERLOO, M. G.
Transformations of Heavy Metals and Plant Nutrients in Dredged Sediments as Affected by Oxidation Reduction Potential and pH, Volume II: Materials and Methods/Results and Discussion,
W79-01201 5C

VERMEER, D. J.
Cation-Exchange Column Behavior in a Desalination Process with Regenerant Recovery,
W79-01280 3A

VERMEULEN, T.
Cation-Exchange Column Behavior in a Desalination Process with Regenerant Recovery,
W79-01280 3A

Cyclic Performance of Layered Beds for Binary Ion Exchange,
W79-01339 3A

Mixed-Bed Ion Exchange Desalting by the Calcium Hydroxide Process,
W79-01340 3A

VITBERG, A. K.
Implementing 'Best Management Practices' for Residuals: The Waste Exchange,
W79-01309 5G

VORCHHEIMER, N.
Cationic Chlorine-Resistant Polymeric Flocculants and Their Use,
W79-01406 5D

WADE, J. C.
An Economic Evaluation of Cropland Use as a Control for Sediment Nonpoint Pollution,
W79-01498 5G

WAHBY, S. D.
Fertilizing Fish Ponds: I. Chemistry of the Waters,
W79-01286 5C

WALKER, M.
The 'Standards and Price' Approach to Pollution Control: Problems of Iteration,
W79-01497 5G

WALLINGFORD, G. W.
Effect of Beef-Feedlot-Lagoon Water on Soil Chemical Properties and Growth and Composition of Corn Forage,
W79-01290 5C

WALTER, I.
Seabed Resources and International Law,
W79-01158 6E

WARD, G. K.
The Density of Seawater Solutions at One Atmosphere as a Function of Temperature and Salinity,
W79-01064 2K

WARDLE, W. J.
The Feasibility of Suspension Culture of Oysters (Crassostrea Virginica) at a Petroleum Platform off the Texas Coast,
W79-01024 5C

WARREN, J. E.
A Manual for the Evaluation of a State Drinking Water Supply Program,
W79-01313 5F

WATTERS, K. W.
Waste Heat Aquaculture,
W79-01467 5C

WAYENBERG, J.
Microwave Remote Sensing of Sea Ice in the Aidjex Main Experiment,
W79-01386 2C

WEBBER, W.
Viewpoint from the Capital Market,
W79-01488 6B

WEBER, J. H.
Electron Spin Resonance Analysis of Semiquinone Free Radicals of Aquatic and Soil Fulvic and Humic Acids,
W79-01133 5A

WEED, S. B.
Drainage Control to Diminish Nitrate Loss from Agricultural Fields,
W79-01137 5G

WEGMULLER, H.
Process for the Purification of Industrial Effluents,
W79-01396 5D

WEISEL, G. F.
Heavy Metal Accumulation and its Effect on the Biota of an Industrial Settling Pond,
W79-01124 5D

WENGERT, N.
Fragile Lands and People,
W79-01487 6B

WENNEMER, J.
Abundance, Diversity, and Stability in Shore-Zone Fish Communities in an Area of Long Island Sound Affected by the Thermal Discharge of a Nuclear Power Station,
W79-01021 5C

WHIPPLE, W. JR.
Urban Runoff Pollution and Water Quality Planning,
W79-01134 5B

Water Quality: Problems and Research Needs,
W79-01348 6B

WHITE, E. B.
Apparatus for Use in Water Purification Particularly Sewage Treatments,
W79-01418 5D

WHITE, R. K.
Automated Treatment and Recycle of Swine Feedlot Wastewaters,
W79-01316 5D

WHITEHEAD, R. L.
Water Resources of the Upper Henrys Fork Basin in Eastern Idaho.
W79-01364 6D

WIEKING, W.
Groundwater Law: More Questions Than Answers,
W79-01118 6E

WIKSTROM, L. L.
Potentiodynamic Studies of Antimony in Acidic and Alkaline Solutions,
W79-01232 8G

WILDEMAN, T. R.
Mine Effluents in the Front Range Mineral Belt of Colorado,
W79-01008 5B

WILEY, A. J.
Removal of Soluble BOD sub 5 Primary Clarifiers,
W79-01317 5D

WILFORD, W. A.
Organic Contaminants,
W79-01471 5C

WILLIAMS, G. P.
The Case of the Shrinking Channels-The North Platte and Platte Rivers in Nebraska,
W79-01380 4A

WILLIAMS, J. R.
Optimal Operation of Large Agricultural Watersheds with Water Quality Constraints,
W79-01355 4D

WILLIAMS, W. G.
Evaluation of Clinoptilolite for Ammonia Removal,
W79-01464 5D

WILSON, J. R.
Some Observed Statistical Properties of Small Scale Turbulence,
W79-01055 2L

WILSON, S. A.
Electron Spin Resonance Analysis of Semiquinone Free Radicals of Aquatic and Soil Fulvic and Humic Acids,
W79-01133 5A

WISE, H. F.
Policy Implications of Urban Land Practices for Groundwater Quality,
W79-01146 5G

WOLFF, A. H.
Precision Analysis for Waterborne Chrysotile Asbestos by Transmission Electron Microscopy,
W79-01010 5A

WOLK, K. F.
Market Input/Output Studies. Task I. Vinylidene Chloride,
W79-01500 6B

WON, W. D.
Toxicity and Mutagenicity of 2,4,6-Trinitrotoluene and Its Microbial Metabolites,
W79-01012 5C

WRIGHT, D. L.
Controlling Erosion Along Highways with Vegetation or Other Protective Cover,
W79-01059 4D

WYLIE, E. B.
Control of Transients in Series Channel with Gates,
W79-01255 8B

YAMAZAKI, S.
Effluent Oil Collecting Vessel,
W79-01419 5G

YEAPLE, D. S.
Sensitivity Analysis of a Phosphorus Removal Strategy Computer Model,
W79-01310 5D

YEARN, K. W.
Distribution of Trace Metals and Sediments in Estuaries of the Kum River and the Mankyung River,
W79-01014 5B

YEH, W. W-G.
Parameter Identification in an Inhomogeneous Medium with Finite Element Method,
W79-01341 2F

YOO, K. H.
Simulation of Soil Erosion in the Palouse Praine of the Pacific Northwest,
W79-01087 4D

YOON, Y. S.
Parameter Identification in an Inhomogeneous Medium with Finite Element Method,
W79-01341 2F

YOSHIDA, S.
Method of Treating Waste Water with Activated Sludge,
W79-01403 5D

YOSHIMURA, S.
Application of Packed Biopolar Cell to Electrolytic Treatment of Waste Waters, (In Japanese),
W79-01080 5D

YOSHIZAWA, S.
Application of Packed Biopolar Cell to Electrolytic Treatment of Waste Waters, (In Japanese),
W79-01080 5D

YOUNG, D. R.
Geochemistry of Mercury in Palos Verdes Sediments,
W79-01250 5B

YOUNG, R. W.
Treating Paint Waste Solids,
W79-01416 5D

ZAGURAL'SKAYA, L. M.
The Decomposition of Some Peat-Forming Plants Under Natural Conditions,
W79-01300 2H

Interrelation Between Insect Larvae and Soil Microflora in Forest Bogs,
W79-01301 2G

Micro-Inhabitants of Marsh Peat Soils in the Tomsk Region,
W79-01299 2H

ZAMUDA, C. D.
Seasonal Growth and Decomposition of Vallisneria americana in the Pamlico River Estuary,
W79-01362 5C

ZASLAVSKIY, S. V.
Tailings Cofferdams on Permafrost Foundations in Yakutskaya ASSR,
W79-01051 8D

ZAWADZKI, I. I.
Correlations Between Maximum Rate of Precipitation and Mesoscale Parameters,
W79-01036 2B

ORGANIZATIONAL INDEX

ABCOR, INC., WILMINGTON, MA. WALDEN RESEARCH DIV.
Treatment of Electroplating Wastes by Reverse Osmosis,
W79-01320 5D

ACKENHEIL AND ASSOCIATES GEO SYSTEMS, INC., PITTSBURGH, PA.
Feasibility Study, Fly Ash Reclamation of Surface Mines, Hillman State Park, Feasibility Study,
W79-01323 5G

ADELAIDE UNIV. (AUSTRALIA). DEPT. OF CIVIL ENGINEERING.
Control of Transients in Series Channel with Gates,
W79-01255 8B

AEROMETRIC RESEARCH INC., GOLETA, CA.
Randomized Cloud Seeding in the San Juan Mountains, Colorado,
W79-01035 3B

AGRICULTURAL RESEARCH COUNCIL, KHARTOUM (SUDAN).
Aquatic Weed Management: Some Prospects for the Sudan and the Nile Basin, Report of a Workshop Held at Khartoum, Sudan on 24-29 November 1975.
W79-01205 5G

AGRICULTURAL RESEARCH SERVICE, DURANT, OK. WATER QUALITY MANAGEMENT LAB.
Nutrient Recovery from Farm Ponds: Hydroponic Plant Production and Other Means, a Review,
W79-01477 5C

AGRICULTURAL RESEARCH SERVICE, TEMPLE, TX.
Generation of Daily Precipitation Over an Area,
W79-01261 2B

AIR FORCE GEOPHYSICS LAB., HANSCOM AFB, MA.
Heat and Thrust Requirements of a Thermal Fog Dispersal System,
W79-01058 3B

AKADEMIYA NAUK SSSR, LENINGRAD. WHITE SEA BIOLOGICAL STATION.
Effect of Dibasol and Vitamin B12 on the Larvae of Aurelia Aurita (Soyphoza) in a Reduced Saline Medium,
W79-01451 5C

AKADEMIYA NAUK SSSR, SIBIRSKOYE OTDELENIYE.
Interrelation of Forest and Bog.
W79-01297 2H

ALASKA UNIV., COLLEGE. INST. OF MARINE SCIENCE.
Hydrocarbons in the Marine Environment of Port Valdex, Alaska,
W79-01254 5B

ALASKA UNIV., FAIRBANKS. INST. OF MARINE SCIENCE.
Uptake and Release of Petroleum by Intertidal Sediments at Port Valdez, Alaska,
W79-01022 5B

ALEXANDRIA INST. OCEANOGRAPHY AND FISHERIES (EGYPT).
Fertilizing Fish Ponds: I. Chemistry of the Waters,
W79-01286 5C

AMERICAN DEFENSE PREPAREDNESS ASSOCIATION, WASHINGTON, DC.
State-of-the-Art: Military Explosives and Propellants Production Industry, Vol. III – Wastewater Treatment,
W79-01318 5D

AMERICAN INST. OF PLANNERS, WASHINGTON, DC.
Policy Implications of Urban Land Practices for Groundwater Quality,
W79-01146 5G

AMERON, INC., SOUTH GATE, CA. (ASSIGNEE).
System for Removal of Toxic Heavy Metals from Drinking Water,
W79-01393 5F

AMOCO PRODUCTION CO., TULSA, OK.
Fluid Development for Drilling Sloughing and Heaving Shales,
W79-01104 8G

APPLIED BIOCHEMISTS, INC., MEQUON, WI. (ASSIGNEE).
Algaecidal Composition,
W79-01401 5F

ARIZONA UNIV., TUCSON. DEPT. OF AGRICULTURAL ECONOMICS.
Economic Value of Hunting, Fishing, and General Rural Outdoor Recreation,
W79-01430 6B

ARIZONA UNIV., TUCSON. DEPT. OF HYDROLOGY AND WATER RESOURCES.
Environment, Power, and Impact Assessment: The Politics of Information,
W79-01229 6G

ARIZONA UNIV., TUCSON. SCHOOL OF RENEWABLE NATURAL RESOURCES.
Characteristics of Arizona Ponderosa Pine Stands on Sandstone Soils,
W79-01099 2I

An Energy Budget Analysis of Evapotranspiration from Saltcedar,
W79-01231 3B

ARMED FORCES RADIOBIOLOGY RESEARCH INST., BETHESDA, MD.
Effect of DDT and Polychlorinated Biphenyls on Cell Population Growth of Crithidia Fasciculata, A Flagellated Protozoan,
W79-01013 5C

ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
An Ecological Study of a Baldcypress Swamp in St. Charles Parish, Louisiana,
W79-01226 2L

ARMY ENGINEER DIV. HUNTSVILLE, AL. CIVIL STRUCTURES BRANCH.
Crops-Wide Conference on Computer-Aided Design in Structural Engineering, Volume XI: Earthquake and Dynamic Analyses,
W79-01057 8G

ARMY ENGINEER DIV. NORTH PACIFIC, BONNEVILLE, OR. DIV. HYDRAULIC LAB.
Fish Ladder for Charles River Dam, Charles River, Massachusetts, Hydraulic Model Investigation,
W79-01052 8I

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MS.
Calculating and Routing the Teton Dam-Break Flood,
W79-01271 8B

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MS. SOILS AND PAVEMENTS LAB.
A Probabilistic Analysis of Embankment Stability Problems,
W79-01054 8D

ASIAN INST. OF TECH., BANGKOK (THAILAND). DIV. OF WATER RESOURCES ENGINEERING.
Stochastic Modeling of Monthly and Daily Rainfall Sequences,
W79-01244 2B

ATLANTIC RICHFIELD HANFORD CO., RICHLAND, WA.
Transmissivity and Hydraulic Conductivity of Saturated Sedimentary Rocks in the Hanford Reservation,
W79-01053 8B

AUBURN UNIV., AL. DEPT. OF CIVIL ENGINEERING.
The Effectiveness of Sand Filters for the Removal of Specific Viruses from Water Using Selected Cations as Filter Aids,
W79-01352 5D

AUBURN UNIV., AL. DEPT. OF FISHERIES AND ALLIED AQUACULTURES.
Nitrogen Fertilization of Ponds,
W79-01439 5C

AUERBACH ASSOCIATES, INC., PHILADELPHIA, PA.
Market Input/Output Studies. Task I. Vinylidene Chloride,
W79-01500 6B

AUSTRALIAN NATIONAL UNIV., CANBERRA. DEPT. OF ZOOLOGY.
Uptake of Zinc by the Aquatic Larvae of Simulium Ornatipes (Diptera: Newatocera),
W79-01026 5C

BATTELLE COLUMBUS LAB., DUXBURY, MA.
Abundance, Diversity, and Stability in Shore-Zone Fish Communities in an Area of Long Island Sound Affected by the Thermal Discharge of a Nuclear Power Station,
W79-01021 5C

BATTELLE COLUMBUS LAB., OH.
Review of R & D on Water Hyacinth Utilization in the Philippine Republic,
W79-01470 4A

BATTELLE MEMORIAL INST., COLUMBUS, OH.
An Assessment of Technology for Possible Utilization of Bayer Process Muds,
W79-01315 5D

BATTELLE PACIFIC NORTHWEST LABS., RICHLAND, WA.
Parameterization of Sulfate Removal by Precipitation,
W79-01038 5B

BENCKISER-KNAPSACK G.M.B.H., LADENBURG AM NECKAR (WEST GERMANY) (ASSIGNEE).
Method for Sequestering Metal Ions,
W79-01417 5G

BETZ LABS., INC., TREVOSE, PA. (ASSIGNEE).
Cationic Chlorine-Resistant Polymeric Flocculants and Their Use,
W79-01406 5D

BHABHA ATOMIC RESEARCH CENTER, BOMBAY (INDIA). DIV. OF RADIOLOGICAL PROTECTION.
Geochemical Implications of Summer Monsonnal Rainwater Composition Over India,
W79-01039 2K

BIRMINGHAM UNIV. (ENGLAND). DEPT. OF CIVIL ENGINEERING.
Reaeration Performance of Stepped Cascades,
W79-01249 5G

BRIDGESTONE TIRE CO., LTD., TOKYO (JAPAN). (ASSIGNEE).
Oil Boom for Damming and Collecting a Floating Oil Slick,
W79-01394 5G

BRISTOL UNIV. (ENGLAND). DEPT. OF CIVIL ENGINEERING.
Simulation of Flood Waves in Channels,
W79-01060 2E

BRITISH COLUMBIA UNIV., VANCOUVER. DEPT. OF MATHEMATICS.
Renewable Resource Management and Extinction,
W79-01495 6A

BRITISH COLUMBIA UNIV., VANCOUVER. FACULTY OF COMMERCE AND BUSINESS ADMINISTRATION.
The Effect of Some Basic Statistical and Biological Principles on Water Pollution Control,
W79-01243 5G

BRITISH PETROLEUM CO. LTD., SUNBURY-ON-THAMES (ENGLAND). (ASSIGNEE).
Breakwater,
W79-01400 8A

BROOKINGS INSTITUTION, WASHINGTON, DC.
Effects of Selected Changes in the Institutional and Human Environment Upon Output Per Unit of Input,
W79-01491 6B

BUREAU OF MINES, TWIN CITIES, MN. TWIN CITIES MINING RESEARCH CENTER.
Field Permeability Methods for In-Place Leaching,
W79-01111 2F

BUREAU OF RECLAMATION, DENVER, CO. ENGINEERING AND RESEARCH CENTER.
Flood Plain Inundation Caused by Dam Failure,
W79-01265 8B

Water -- Demand and Supply: Economic Impacts,
W79-01482 6B

BUREAU OF RECLAMATION, DENVER, CO. ENGINEERING RESEARCH CENTER.
A Simulation of the Hydraulic Events During and Following the Teton Dam Failure,
W79-01269 8B

CALIFORNIA STATE DEPT. OF WATER RESOURCES, SACRAMENTO.
Well Logs...Are They Really Necessary,
W79-01119 7C

CALIFORNIA UNIV., BERKELEY. DEPT. OF BOTANY.
The Ecotone Between Spartina Folisoa Trin. and Salicornia Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay, I. Biomass and Production,
W79-01217 2L

The Ecotone Between Spartina Foliosa Trin. and Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay: II. Soil Water and Salinity,
W79-01218 2L

The Ecotone Between Spartina Foliosa Trin. and Salicornia Virginica L. in Salt Marshes of Northern San Francisco Bay: III. Soil Aeration and Tidal Immersion,
W79-01283 2L

CALIFORNIA UNIV., BERKELEY. DEPT. OF CHEMICAL ENGINEERING.
Cation-Exchange Column Behavior in a Desalination Process with Regenerant Recovery,
W79-01280 3A

Cyclic Performance of Layered Beds for Binary Ion Exchange,
W79-01339 3A

Mixed-Bed Ion Exchange Desalting by the Calcium Hydroxide Process,
W79-01340 3A

CALIFORNIA UNIV., BERKELEY. DEPT. OF CIVIL ENGINEERING.
Mixing and Dispersion in Estuaries,
W79-01338 5B

CALIFORNIA UNIV., BERKELEY, SCHOOL OF PUBLIC HEALTH.
Toxicity and Mutagenicity of 2,4,6-Trinitrotoluene and Its Microbial Metabolites,
W79-01012 5C

Reconciliation of Apparent Nonequivalence Among Alternative Rating Methods,
W79-01240 6B

CALIFORNIA UNIV., BERKELEY. SEA WATER CONVERSION LAB.
Solar-Assisted Still with Vapor-Compression Option,
W79-01126 3A

Solar-Assisted Distillation of Sea Water,
W79-01239 3A

Investigation of Heat Transfer Coefficients of Working Fluids in Geothermal Power Cycles,
W79-01279 4B

Renovation of Industrial Inorganic Wastewater by Evaporation with Interface Enhancement,
W79-01319 5D

Polarization at Membrane/Solution Interfaces,
W79-01342 3A

The Role of Membrane Methods in the Desalination of Brackish Water,
W79-01343 3A

CALIFORNIA UNIV., DAVIS DEPT. OF AGRONOMY AND RANGE SCIENCE.
The Effect of Dirunal Variation in Light and Temperature on the Acetylene Reduction Activity (N2 Fixation) of Subterranean Clover,
W79-01092 2I

CALIFORNIA UNIV., DAVIS. DEPT. OF CIVIL ENGINEERING.
Regional Ground-Water Management,
W79-01105 4B

A Nonstructural Approach to Control Salt Accumulation in Ground Water,
W79-01132 5B

CALIFORNIA UNIV., DAVIS. DEPT. OF LAND, AIR AND WATER RESOURCES.
Aspects of the Life History and Growth of Acroneuria (Calineuria) Californica in a Sierra Foothill Stream,
W79-01125 2I

Effect of Mulching on Sediment in Runoff from Simulated Rainfall,
W79-01130 4D

Evaluation of Wild Oat Straw as a Soil Erosion Retardant Using Simulated Rainfall,
W79-01131 4D

Effects of Kelthane and Temperature on the Respiration of Crangon Franciscorum,
W79-01241 5C

CALIFORNIA UNIV., DAVIS. DEPT. OF WATER SCIENCE AND CIVIL ENGINEERING.
Comparative Analysis of Routing Techniques for the Floodwave from a Ruptured Dam,
W79-01272 8B

CALIFORNIA UNIV., IRVINE.
Use of Unicellular Algae for Evaluation of Potential Aquatic Contaminants,
W79-01476 5A

CALIFORNIA UNIV., IRVINE. DEPT. OF ECOLOGY AND EVOLUTIONARY BIOLOGY.
Calcification and Its Role Among the Macroalgae,
W79-01097 2I

CALIFORNIA UNIV., IRVINE. SCHOOL OF ENGINEERING.
Metals from Urban Runoff in Dated Sediments of a Very Shallow Estuary,
W79-01251 5A

CALIFORNIA UNIV., LOS ANGELES. DEPT. OF ENGINEERING SYSTEMS.
Regional Water Supply Capacity Expansion with Seasonal Demands and Energy Costs,
W79-01002 6A

Parameter Identification in an Inhomogeneous Medium with Finite Element Method,
W79-01341 2F

CALIFORNIA UNIV., LOS ANGELES. SCHOOL OF ARCHITECTURE AND URBAN PLANNING.
Trade Off Analysis in Environmental Decision-making: An Alternative to Weighted Decision Models,
W79-01242 6G

CALIFORNIA UNIV., LOS ANGELES. SCHOOL OF ENGINEERING AND APPLIED SCIENCE.
High-Temperature Solubilities of Calcium Sulfate Hemihydrate and Anhydrite in Natural Seawater Concentrates,
W79-01128 3A

Specification of Cellulose Acetate to be Used in Semipermeable Membranes,
W79-01129 3A

Potentiodynamic Studies of Antimony in Acidic and Alkaline Solutions,
W79-01232 8G

Polarization and Photopotentials of InSb in NaOH,
W79-01233 8G

Electrodissolution of Nickel in Molten LiCl-KCl,
W79-01234 8G

Hydrogen Evolution and Corrosion Behavior of Fe-Ni Alloys in H2SO4 - Effect of Temperature, C1- and Benzatriazole,
W79-01235 8G

Electrochemical Behavior of Rotating Iron Disks Effect of FE(111),
W79-01281 8G

CALIFORNIA UNIV., RIVERSIDE. DEPT. OF PLANT PATHOLOGY.
Ultrastructure of the Blue-Green Alga Anacystis Nidulans Infected with AS-1 Virus,
W79-01334 5C

CALIFORNIA UNIV., RIVERSIDE. DEPT. OF SOIL SCIENCE AND AGRICULTURAL ENGINEERING.
Cadmium Availability to Rice in Sludge-Amended Soil Under 'Flood' and 'Nonflood' Culture,
W79-01127 5E

Effect of Soil Application of Dairy Manure on Germination and Emergence of Some Selected Crops,
W79-01236 5C

Yield and Cadmium Accumulation of Forage Species in Relation to Cadmium Content of Sludge-Amended Soil,
W79-01237 5C

Growth and Cadmium Accumulation of Plants Grown on a Soil Treated with a Cadmium-Enriched Sewage Sludge,
W79-01282 5C

CAMBRIDGE UNIV. (ENGLAND). DEPT. OF GEOGRAPHY.
Inland Mangroves and Water Chemistry, Barbuda, West Indies,
W79-01215 2K

CANADA CENTRE FOR INLAND WATERS, BURLINGTON (ONTARIO).
The Effect of Temperature on the Development of Diapausing and Subitaneous Eggs in Several Freshwater Copepods,
W79-01033 5C

Lag Adjustment Between Estimated and Actual Physiological Responses Conducted in Flow-Through Systems,
W79-01445 5C

CARRIER DRYSYS LTD., LONDON (ENGLAND). (ASSIGNEE).
Treating Paint Waste Solids,
W79-01416 5D

CEA CENTRE D'ETUDES NUCLEAIRES DE CADARACHE, SAINT-PAUL-LES-DURANCE (FRANCE). LAB. D'ETUDE DE LA POLLUTION DES EAUX.
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W79-01442 5C

CENTER FOR THE STUDY OF DEMOCRATIC INSTITUTIONS, SANTA BARBARA, CA.
A Constitution for the Oceans: Comments and Suggestions Regarding Part XI of the Informal Composite Negotiating Text,
W79-01149 6E

CHARLESTON COLL., SC.; AND SOUTH CAROLINA WILDLIFE AND MARINE RESOURCES DEPT., CHARLESTON.
Additions to the Freshwater Algae of South Carolina,
W79-01203 5C

CIBA-GEIGY CORP., ARDSLEY, NY. (ASSIGNEE).
Process for the Purification of Industrial Effluents,
W79-01396 5D

COLORADO SCHOOL OF MINES GOLDEN.
Mine Effluents in the Front Range Mineral Belt of Colorado,
W79-01008 5B

Geochemistry of Mine Effluents in the Front Range Mineral Belt of Colorado,
W79-01363 5A

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF EARTH RESOURCES.
Salt Pickup by Overland Flow in the Price River Basin, Utah,
W79-01245 5B

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF POLITICAL SCIENCE.
Fragile Lands and People,
W79-01487 6B

COLORADO UNIV., BOULDER. DEPT. OF ENVIRONMENTAL, POPULATION, AND ORGANISMIC BIOLOGY.
Water Chemistry and the Reliability of Electronic Field Instruments,
W79-01333 5A

COLORADO UNIV., BOULDER. DEPT. OF SOCIOLOGY.
Population Growth and Socio-Economic Balance: How to Visualize Alternative Futures,
W79-01485 6B

CONCORDIA UNIV., MONTREAL (QUEBEC).
The Response of Firms to Pollution Charges,
W79-01499 5G

CONNECTICUT UNIV., STORRS.
The Effect of Several Physical and Chemical Factors Upon the Distribution of Benthic Macroinvertebrates in Dunham Pond, Connecticut,
W79-01330 5C

A Chemical Budget of a Soft-Water Bog Lake: Benthic Contributions,
W79-01423 2H

CONNECTICUT UNIV., STORRS. DEPT. OF CIVIL ENGINEERING.
Drift Velocity of Surface Films Over Waves,
W79-01139 5B

CONNECTICUT UNIV., STORRS. INST. OF WATER RESOURCES.
A Bioassay Technique to Evaluate the Effect of Secondary Effluent on Algal Interactions in the Connecticut River,
W79-01089 5C

Characteristics of Incinerator Residue and the Effect of its Leachate on Groundwater Quality,
W79-01090 5B

Sedimentation and Microbial Metabolism in a Shallow Estuary,
W79-01091 2J

Removal of Metallic Impurities from Water by Electrochemical Methods,
W79-01121 5D

Inland Wetland Definitions,
W79-01335 6E

CONNETICUT UNIV., STORRS. INST. OF WATER RESOURCES.
Dissolved Organic Carbon Fluxes in the Shetucket River of Eastern Connecticut, USA,
W79-01337 5C

CORNELL UNIV., ITHACA, NY.
Can Salamanders and Frogs Survive the Threat of Acid Precipitation,
W79-01005 5C

CORNELL UNIV., ITHACA, NY. LAB OF SOIL MICROBIOLOGY.
Recovery of Nitrosamines from Water,
W79-01006 5D

CORVALLIS ENVIRONMENTAL RESEARCH LAB., OR.
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W79-01195 5C

COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH, PRETORIA (SOUTH AFRICA).
Observations on Algal Populations and Experimental Maturation Pond System,
W79-01196 5D

D.A.V. COLL., MUZAFFARNAGAR (INDIA). DEPT. OF ZOOLOGY.
Effect of Mercuric Chloride on the Digestive System of a Teleost Fish, Channa Punctatus,
W79-01019 5C

DALHOUSIE UNIV., HALIFAX (NOVA SCOTIA). DEPT. OF BIOLOGY.
Nitrogen Accretion, and the Nature and Possible Significance of N2 Fixation (Acetylene Reduction) in a Nova Scotian Spartina Alterniflora Stand,
W79-01214 5C

DELAWARE UNIV., LEWES. MARINE STUDIES COMPLEX.
Trace Metal Enhancement in the Biotic and Abiotic Components of an Estuarine Tidal Front,
W79-01046 5B

DELAWARE UNIV., NEWARK. DEPT. OF BIOLOGICAL SCIENCES.
Response in Production of Cord Grass, Spartina Alterniflora, to Inorganic Nitrogen and Phosphorus Fertilizer,
W79-01225 2L

Nitrate and Nitrite in the Surface Waters of Two Delaware Salt Marshes,
W79-01291 5B

Primary Production of Edaphic Algal Communities in a Delaware Salt Marsh,
W79-01296 5C

DENVER FEDERAL EXECUTIVE BOARD, CO.
Conference Proceedings - A Critical Economic Balance, Water - Land - Energy - People - Held at Colorado State University, Pingree Park Campus on June 6-7, 1977,
W79-01478 6B

DENVER UNIV., CO. COLL. OF LAW.
Legal and Institutional Planning for Macro-Conservation Measures,
W79-01227 6E

DENVER UNIV., CO. DEPT. OF GEOGRAPHY.
Colorado Big Thompson Flood: Geologic Evidence of a Rare Hydrologic Event,
W79-01047 2E

DEPART OF ENERGY, WASH., DC. (ASSIGNEE).
Tidal Sampler,
W79-01388 7B

DEPARTMENT OF ENERGY, MINES AND RESOURCES, OTTAWA (ONTARIO).
Purification of Water for Boiler,
W79-01405 5F

DEPARTMENT OF LABOR, WASHINGTON, DC. OFFICE OF THE UNDER SECRETARY.
Regional - Implications - Overview of National Energy Employment Relations,
W79-01483 6B

DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH, LOWER HUTT (NEW ZEALAND). PHYSICS AND ENGINEERING LAB.
Applying a Chemical Modelling Technique to Ecological Problems,
W79-01444 5B

DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH, TAUPO (NEW ZEALAND). ECOLOGY DIV.
An Improved Hydrazine Reduction Method for the Automated Determination of Low Nitrate Levels in Freshwater,
W79-01042 5A

DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO). MARINE SCIENCES DIRECTORATE.
Some Observed Statistical Properties of Small Scale Turbulence,
W79-01055 2L

DREW CHEMICAL CORP., BOOTON, NJ. (ASSIGNEE).
Recovery and Reuse of Paint Solids from Waste Water,
W79-01391 5D

DREXEL UNIV., PHILADELPHIA, PA. DEPT. OF PHYSICS AND ATMOSPHERIC SCIENCES.
Prediction of Convective Activity Using a System of Parasitic-Nested Numerical Models,
W79-01056 2B

DUKE UNIV., BEAUFORT, NC. MARINE LAB.
Suspension-Feeding Aquaculture Systems: Effects of Phytoplankton Concentration and Temperature on Growth of the Bay Scallop,
W79-01285 5C

EAST CAROLINA UNIV., GREENVILLE. DEPT. OF BIOLOGY.
Phosphorus Cycling in Nuphar luteum Communities in the Lower Chowan River, North Carolina,
W79-01326 5C

Seasonal Growth and Decomposition of Vallisneria americana in the Pamlico River Estuary,
W79-01362 5C

EIDGENOESSISCHE ANSTALT FUER WASSERVERSORGUNG, ABWASSERREINIGUNG UND GEWAESSERSCHUTZ, ZURICH (SWITZERLAND).
Quantitative Determination of Quaternary Ammonium Bases (QAB) in Water and Wastewater by Thin Layer Chromatography,
W79-01070 5A

ENERGY INC. IDAHO FALLS, ID.
A Numerical Model for Multidimensional Unconstrained Flow Over Irregular Terrain,
W79-01275 8B

ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION, SAN FRANCISCO, CA. CONSUMER AFFAIRS. CA.
Critique and Challenges,
W79-01490 6B

ENVIRONMENTAL ASSESSMENT COUNCIL, INC., NEW BRUNSWICK, NJ.
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W79-01031 5C

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W79-01469 5C

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W79-01209 5B

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ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, DC. OFFICE OF AIR AND WATER PROGRAMS.
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A Manual for the Evaluation of a State Drinking Water Supply Program,
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W79-01309 5G

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W79-01453 5C

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Effect of Long-Term Reduction and Diel Fluctuation in Dissolved Oxygen on Spawning of Black Crappie, Pomoxis Nigromaculatus,
W79-01440 5C

Organic Contaminants,
W79-01471 5C

ENVIRONMENTAL RESEARCH LAB., NARRAGANSETT, RI.
Effect of Thermal Shock on Predator Avoidance by Larvae of Two Fish Species,
W79-01454 5C

Influence of Sediment in Copper Toxicity Tests with the Polychaete Neanthes Arenaceodentata,
W79-01460 5A

FEDERAL ENERGY ADMINISTRATION, LAKEWOOD, CO. REGION VIII.
The National Energy Plan,
W79-01480 6B

FEDERAL ENERGY ADMINISTRATION, LAKEWOOD, CO. SOCIOECONOMIC PROGRAM AND DATA COLLECTION OFFICE.
Coordinated Energy Management,
W79-01479 6B

FEDERAL ENERGY REGULATORY COMMISSION, WASHINGTON, DC.
Simplified Routing through Reservoir,
W79-01266 4A

FEDERATION OF ROCKY MOUNTAIN STATES, DENVER, CO. WESTERN STATES ENERGY POLICY OFFICE.
Legitimacy of Western Identity in an Economic Balance Water - Land - Energy - People,
W79-01481 6B

FERTIILZER ASSOCIATION OF INDIA, TROMBAY.
Hydrogen Recovery from Purge Gas of Ammonia Plants,
W79-01067 5D

FILTERS INTERNATIONAL, INC., CHICAGO, IL. (ASSIGNEE).
Apparatus for Use in Water Purification Particularly Sewage Treatments,
W79-01418 5D

FISH AND WILDLIFE SERVICE, CORVALLIS, OR. PATUXENT WILDLIFE RESEARCH CENTER.
Great Blue Herons Respond to Nesting Habitat Loss,
W79-01432 6G

FISH AND WILDLIFE SERVICE, PORTLAND, OR.
Pollution Abatement Facilities at National Fish Hatcheries,
W79-01463 5G

FISHERIES AND MARINE SERVICE, NANAIMO (BRITISH COLUMBIA). PACIFIC BIOLOGICAL STATION.
Mortalities of Pen-Reared Salmon Associated with Blooms of Marine Algae,
W79-01462 5C

FLORIDA DEPT. OF NATURAL RESOURCES, TALLAHASSEE. DIV. OF MARINE RESOURCES.
Rules and Procedure for Coastal Construction and Excavation.
W79-01186 6E

FLORIDA UNIV., GAINESVILLE. SCHOOL OF FOREST RESOURCES AND CONSERVATION.
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W79-01292 4C

A Biological Assessment of Fish and Benthic Populations Inhabiting a Kraft Mill Effluent Channel,
W79-01448 5C

FLORIDA UNIV., GAINSVILLE, FL. DEPT. OF ENVIRONMENTAL ENGINEERING SCIENCES.
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W79-01030 5C

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W79-01259 5C

GENERAL ACCOUNTING OFFICE, WASHINGTON, DC.
The Tennessee Valley Authority's Tellico Dam Project-Costs, Alternatives, and Benefits.
W79-01193 6B

GENERAL ELECTRIC CO., SANTA BARBARA, CA.
Energy Conservation: Is the Heat Storage Well the Key.,
W79-01228 4B

Heat Storage Wells Conserve Fuels,
W79-01230 4B

GEOLOGICAL SURVEY, ALBANY, NY. WATER RESOURCES DIV.
Digital-Model Simulation of the Glacial-Outwash Aquifer, Otter Creek-Dry Creek Basin, Cortland County, New York,
W79-01377 2F

GEOLOGICAL SURVEY, BOISE, ID. WATER RESOURCES DIV.
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W79-01364 6D

GEOLOGICAL SURVEY, BOSTON, MA. WATER RESOURCES DIV.
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W79-01372 7C

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W79-01379 7C

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W79-01387 2F

GEOLOGICAL SURVEY, LAKEWOOD, CO. WATER RESOURCES DIV.
An Automated Procedure for the Simultaneous Determination of Specific Conductance and pH in Natural Water Samples,
W79-01374 2K

The Case of the Shrinking Channels-The North Platte and Platte Rivers in Nebraska,
W79-01380 4A

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Gas-Driven Pump for Ground-Water Supplies,
W79-01378 8C

GEOLOGICAL SURVEY, MADISON, WI. WATER RESOURCES DIV.
Hydrology of the Nevin Wetland Near Madison, Wisconsin,
W79-01213 2H

Low-Flow Characteristics of Streams in the Rock-Fox River Basin, Wisconsin,
W79-01366 2E

Probable Yields of Wells in the Niagara Aquifer, Wisconsin,
W79-01367 7C

Dissolved-Solids Concentrations of Water in the Niagara Aquifer, Wisconsin,
W79-01369 7C

Ground-Water Resources and Geology of Columbia County, Wisconsin,
W79-01384 2F

GEOLOGICAL SURVEY, MENLO PARK, CA.
The Availability of Sediment-Bound Cobalt, Silver, and Zinc to a Deposit-Feeding Clam,
W79-01468 5B

GEOLOGICAL SURVEY, NSTL STATION, MS. GULF COAST HYDROSCIENCE CENTER.
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W79-01274 8B

GEOLOGICAL SURVEY, OKLAHOMA CITY, OK. WATER RESOURCES DIV.
Water-Quality Indices for Specific Water Uses,
W79-01381 5G

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Hydrologic Impact of Land Drainage on Estuaries,
W79-01385 4A

GEOLOGICAL SURVEY, SACRAMENTO, CA. WATER RESOURCES DIV.
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W79-01365 2F

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W79-01386 2C

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W79-01368 7C

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W79-01371 7C

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W79-01373 7C

Chemical Quality of Water Used for Municipal Supply in Florida, 1975,
W79-01375 7C

Program for Monitoring Surface-Water Quality in Florida,
W79-01376 7C

Dissolved-Solids Concentrations and Loads in Florida Surface Waters,
W79-01382 7C

Hydrogeologic Maps of a Flood Detention Area Proposed by Southwest Florida Water Management District Green Swamp Area, Florida,
W79-01383 7C

GEORGE WASHINGTON UNIV., WASHINGTON, DC. NATIONAL LAW CENTER.
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W79-01143 6E

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W79-01061 4C

GEORGIA UNIV., ATHENS. DEPT. OF BOTANY.
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W79-01294 2I

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W79-01211 2H

GEORGIA UNIV., SAPELO ISLAND. MARINE INST.
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W79-01288 5B

GRACE (W. R.) AND CO., DALLAS, TX. MINING DIV.
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W79-01489 6B

GROUND WATER CONSULTANTS GROUP, EDMONTON (ALBERTA).
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W79-01117 4B

HAWAII UNIV., HONOLULU.
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W79-01353 6B

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W79-01360 3F

HITTMAN ASSOCIATES, INC., COLUMBIA, MD.
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W79-01307 5G

HULL UNIV. (ENGLAND). DEPT. OF BIOLOGY.
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W79-01212 2K

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A Societal Assessment of the Proposed Sierra Snowpack Augmentation Project,
W79-01063 3B

HYDROCOMP, INC., PALO ALTO, CA.
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W79-01004 5B

Dam Break Flood Wave Analysis: Problems, Pitfalls, and Partial Solutions,
W79-01276 8B

IDAHO UNIV., MOSCOW. DEPT. OF AGRICULTURAL ENGINEERING.
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W79-01087 4D

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W79-01359 4A

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W79-01403 5D

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY, SPRINGFIELD. DIV. OF LAND POLLUTION CONTROL.
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W79-01156 5G

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W79-01017 5C

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W79-01434 6G

ILLINOIS STATE DEPT. OF TRANSPORTATION, SPRINGFIELD.
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W79-01168 6E

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W79-01351 5F

ILLINOIS UNIV. AT THE MEDICAL CENTER, CHICAGO.
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W79-01010 5A

ILLINOIS UNIV. AT URBANA-CHAMPAIGN. DEPT. OF AGRICULTURAL ECONOMICS.
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W79-01164 5G

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W79-01295 6E

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Nutrient Fluxes in Precipitation, Throughfall, and Stemflow in an Oak-Hickory Forest,
W79-01246 2I

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W79-01404 5D

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W79-01293 5C

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W79-01422 2F

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W79-01107 8B

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W79-01317 5D

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W79-01158 6E

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W79-01498 5G

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W79-01065 2J

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W79-01361 6B

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W79-01473 5B

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Sensitivity Analysis of a Phosphorus Removal Strategy Computer Model,
W79-01310 5D

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Total Mercury and Methyl Mercury Contents in Fish from Lake Paijanne,
W79-01028 5C

KANSAS STATE UNIV., MANHATTAN. DEPT. OF AGRONOMY.
Effect of Beef-Feedlot-Lagoon Water on Soil Chemical Properties and Growth and Composition of Corn Forage,
W79-01290 5C

KANSAS STATE UNIV., MANHATTEN.
Irrigating Corn and Grain Sorghum with Limited Water,
W79-01425 3F

KANSAS STATE UNIV., MANHATTEN. DEPT. OF CHEMICAL ENGINEERING.
Synthesis of Optimal Feedback Control Systems for Fermentations and Biological Waste Treatment Processes,
W79-01428 5D

KRAMER, CHIN, AND MAYO, INC., SEATTLE, WA.
Evaluation of Clinoptilolite for Ammonia Removal,
W79-01464 5D

Ammonia Production Rate and its Application to Fish Culture System Planning and Design,
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Waste Heat Aquaculture,
W79-01467 5C

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Mud and Clay,
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Low Turbulence Settling Tank,
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Production and Dynamics of Experimentally Enriched Salt Marsh Vegetation: Belowground Biomass,
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A Survey of the Freshwater Mussels (Bivalvia: Unionidae) of the Kanawha River of West Virginia,
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Standing Crops of Marsh Vegetation of Two Tributaries of Chesapeake Bay,
W79-01433 2L

Chlorine effects on Larval Development of Striped Bass (Morone Saxatilis), White Perch (M. Americana) and Blueback Herring (Alosa Aestivalis),
W79-01456 5C

MASCHINENFABRIK HELLMUT GEIGER, KARLSRUHE (WEST GERMANY). (ASSIGNEE).
Method and Apparatus for the Biological Cleansing of Waste Water,
W79-01413 5D

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Organic Compounds in the Delaware River,
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Resource Extraction and Recycling with Environmental Costs,
W79-01492 6A

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Building Public/Private Cooperation in the Coastal Zone,
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Stream Channelization Impacts on Songbirds and Small Mammals in Vermont,
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Estimation of Water Balance of Lower Sutlej Catchment Up to Bhakra Dam Site by Thornthwaite's Method,
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The Influence of Colloidal Organic Matter on Iron and Iron-Phosphorus Cycling in an Acid Bog Lake,
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Habitat Use and Home Range of Mallards Breeding in Minnesota,
W79-01287 2I

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Relation of Water Absorption to Duration of Application in Furrow Irrigation,
W79-01094 3F

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W79-01356 5B

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W79-01349 5D

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W79-01421 5B

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Computerized Costing Model for Inland Waterways Barge Transportation,
W79-01493 6A

MITSUBISHI JUKOGYO KABUSHIKI KAISHA, TOKYO (JAPAN). (ASSIGNEE).
Effluent Oil Collecting Vessel,
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A Biological Investigation of an Organically Polluted Urban Stream in Victoria,
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The Feasibility of Suspension Culture of Oysters (Crassostrea Virginica) at a Petroleum Platform off the Texas Coast,
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The Relationship Between Radar Reflectivity Factor and Hail at the Ground for Northeast Colorado Thunderstorms,
W79-01037 7B

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Bioassays on Marine Organisms: Acute Toxicity Test of Mercury, Cadmium, and Copper to Arkshell, Anadara Broughtonii, from Jin-Dong Bay, and to Oyster, Crassostrea Gigas, from Kwangdo Bay, South Coast of Korea,
W79-01015 5C

NATIONAL MARINE FISHERIES SERVICE, BEAUFORT, NC. BEAUFORT LAB.
Effect of Complexation by Natural Organic Ligands on the Toxicity of Copper to a Unicellular Alga, Monochrysis Lutheri,
W79-01449 5C

NATIONAL SECURITY COUNCIL, WASHINGTON, DC. PUBLIC ADVISORY COMMITTEE ON THE LAW OF THE SEA.
Should the Law of the Sea Conference Be Saved,
W79-01157 6E

NATIONAL WATER WELL ASSOCIATION, WORTHINGTON, OH.
Using Large Diameters to Increase Well Storage,
W79-01109 8B

Drilling Large Diameter Wells: The Proof is in the Planning,
W79-01110 8B

The Impact of Hazardous Wastes on Ground Water: Part II,
W79-01113 5B

Regional Geology Series: Part X,
W79-01115 2F

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The Development and Testing of a Dam-Break Flood Forecasting Model,
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NATURE CONSERVANCY, ABBOTS RIPTON (ENGLAND). MONKS WOOD EXPERIMENTAL STATION.
Shell Structure of Immature Roman Snails (Helix Pomatia) After Exposure to P,P'-DDT,
W79-01020 5C

A Water Pollution Survey, Mainly by British School Children,
W79-01354 5G

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Nonmetallic Elutriation and Sieving Device for Benthic Macrofauna,
W79-01447 5G

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W79-01358 5D

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A Preliminary Survey of the Zooplankton and Benthos of an Arctic Lake Near Prudhoe Bay, Alaska,
W79-01427 2H

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Electron Spin Resonance Analysis of Semiquinone Free Radicals of Aquatic and Soil Fulvic and Humic Acids,
W79-01133 5A

NEW HAMPSHIRE UNIV., DURHAM. DEPT. OF CIVIL ENGINEERING.
Nitrogen and Phosphorus Behavior During Aerobic Digestion of Waste Activated Sludge,
W79-01003 5D

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Underground Injection Program Set Under Safe Drinking Water Act,
W79-01154 5G

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Biological Control Agents of Sewage Bacteria in Marine Habitats,
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The Dam-Break Wave and the Bore Collapse on a Beach,
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Evaluation of Micromolar Complexiметric Titrations for the Determination of the Complexing Capacity of Natural Waters,
W79-01344 5A

Determination of the Complexing Capacity of Natural Water by Cobalt (III) Complexation,
W79-01345 5A

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Drainage Control to Diminish Nitrate Loss from Agricultural Fields,
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W79-01122 6B

Non-Resident Hunters--Benefactors or Bad Men.
W79-01138 6B

NORTHUMBRIAN WATER AUTHORITY, GOSFORTH (ENGLAND).
Characteristics of Rainfall Conditions with Particular Reference to North East England,
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NUNN, SNYDER AND ASSOCIATES, FAIRFAX, VA.
Floods from Breaching of Dams,
W79-01267 8B

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Chloro-Organics in Surface Water Sources for Potable Water,
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Primary Production in a Shallow Water Lake with Special Reference to a Reed Swamp,
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Automated Treatment and Recycle of Swine Feedlot Wastewaters,
W79-01316 5D

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Acute Effects of Underwater Construction Blasting on Fishes in Long Point Bay, Lake Erie,
W79-01452 5C

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Criteria for Routing the Dam-Break Flood,
W79-01278 8B

PARAISTEN KALKKI OY, PARGAS (FINLAND). (ASSIGNEE).
Method and Device for Separation of Suspended Material from a Fluid Flow,
W79-01392 5D

PEABODY COAL CO., DENVER, CO. REGIONAL COUNSEL'S OFFICE.
The Industry's Role in Energy Management,
W79-01484 6B

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK.
Characteristics of Small Mammal Populations in Forested and Old Field Habitats Prior to Effluent Spray Irrigation,
W79-01331 5C

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. SCHOOL OF FOREST RESOURCES.
Wastewater Recycling on Forest Lands,
W79-01424 5D

PITTSBURGH UNIV., PA. DEPT. OF CIVIL ENGINEERING.
Differential Bed Kinetic Analysis of Heavy Metal Removals by Biological Slimes,
W79-01314 5D

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In Vitro Changes in the Activity of ATPases in the Gills of Carcinus Maenas Exposed to Various Concentrations of p,p'-DDT,
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Time Averaged Areal Mean of Precipitation: Estimation and Network Design,
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Method for Removing of Multivalent Heavy Metals from Metal Plating Waste Effluents,
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Evaluation of Activated Sludge Hydraulic Control Techniques through Pilot Plant Analyses,
W79-01325 5D

Carbon and Nitrogen Transformations in Soils Amended with Sewage Sludge,
W79-01350 5C

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Geomorphologic Characteristics of Fourteen Indiana Watersheds Obtained from a Computer Data Bank of Stream Networks,
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Correlations Between Maximum Rate of Precipitation and Mesoscale Parameters,
W79-01036 2B

READING UNIV. (ENGLAND). DEPT. OF AGRICULTURE; AND READING UNIV. (ENGLAND). DEPT. OF HORTICULTURE.
Relationships Between Mineral Supply and Growth of Narthecium Ossifragum (L.) Huds. on Mire Ecosystems,
W79-01216 2H

REICHHOLD CHEMICALS, INC., TUSCALOOSA, AL.
Treatment and Disposal of Complex Industrial Wastes,
W79-01321 5D

RHODE ISLAND UNIV., KINGSTON.
Bio-regeneration of Hydrocarbon-Exhausted Activated Carbon.
W79-01093 5D

RHODE ISLAND UNIV., KINGSTON. DEPT. OF ANIMAL PATHOLOGY.
Ozonation for Control of Enteric Viruses in Sewage Effluent,
W79-01088 5D

RHODE ISLAND UNIV., KINGSTON. GRADUATE SCHOOL OF OCEANOGRAPHY.
Fatty Acid Composition of Organic Detritus from Spartina Alterniflora,
W79-01332 5C

ROCKEFELLER UNIV., NEW YORK.
Injurious Effect of Tap Water on Rooting of Cuttings of Bryophyllum Calycinum,
W79-01221 5C

ROSENSTIEL SCHOOL OF MARINE AND ATMOSPHERIC SCIENCE, MIAMI, FL.
The Density of Seawater Solutions at One Atmosphere as a Function of Temperature and Salinity,
W79-01064 2K

ROTHAMSTEAD EXPERIMENTAL STATION, HARPENDEN, (ENGLAND).
Fresh-Water Weeds are a Resource,
W79-01197 5C

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Oxidation-Reduction Chemistry And Aqueous Ammonium Oxidation in the Estimation of Nitrate by the Cadmium Reduction Method,
W79-01100 5B

RUTGERS - THE STATE UNIV., NEW BRUNSWICK, NJ. DEPT. OF ENVIRONMENTAL SCIENCE.
Distribution of Autotrophic Nitrifying Bacteria in a Polluted River (the Passaic),
W79-01007 5B

RUTGERS - THE STATE UNIV., NEW BRUNSWICK, NJ. DEPT. OF SOIL AND CROPS.
Comparison of Iron (III) and Aluminum in Precipitation of Phosphate from Solution,
W79-01095 5D

RUTGERS - THE STATE UNIV., NEW BRUNSWICK, NJ. DEPT. OF ZOOLOGY.
The Influence of Temperature and Salinity on the Toxicity of Hexavalent Chromium to the Grass Shrimp Palaemonetes Pugio (Holthuis),
W79-01457 5C

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Urban Runoff Pollution and Water Quality Planning,
W79-01134 5B
Water Quality: Problems and Research Needs,
W79-01348 6B

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The Effects of Land Use on Phosphorus Loading: A Case Study - Six Mile Run Reservoir,
W79-01086 5C

SACHS-SYSTEMTECHNIK G.M.B.H., SCHWEINFURT (GERMANY, F.R.).
Water Sterilization Apparatus,
W79-01395 5F

SACHS-SYSTEMTECHNIK G.M.B.H., SCHWEINFURT (WEST GERMANY).
Method of Purifying Water,
W79-01402 5F

SAINT JOHN'S UNIV., JAMAICA, NY. DEPT. OF BIOLOGY.
Transplantation of Salt Marsh Vegetation. II. Georgetown, South Carolina,
W79-01306 2L

SAN DIEGO GAS AND ELECTRIC CO., CA.
Scaling and Corrosion in an Experimental Geothermal Power Plants,
W79-01106 3C

SAVANNAH RIVER ECOLOGY LAB. AIKEN, SC.
Thermal Alterations of Aquatic Ecosystems,
W79-01284 5C

SCOTTO (ANTHONY J.), SMITHTOWN, NY. (ASSIGNEE).
Septic Tank-Leaching Pool Arrangement,
W79-01399 5D

SCRIPPS INST. OF OCEANOGRAPHY, LA JOLLA, CA.
Chlorinated Hydrocarbons in Marine Insects,
W79-01023 5B

SCRIPPS INSTITUTION OF OCEANOGRAPHY, LA JOLLA, CA.
Polyhalogenated 1-Octene-3-Ones, Antibacterial Metabolites from the Red Seaweed Bonnemaisonia Asparagoides,
W79-01204 5C

SEOUL NATIONAL UNIV. (REPUBLIC OF KOREA). DEPT. OF OCEANOGRAPHY.
Distribution of Trace Metals and Sediments in Estuaries of the Kum River and the Mankyung River,
W79-01014 5B

SHIKOKU PAPER MFG. CO., LTD., (JAPAN). (ASSIGNEE).
Method of Purification of Waste Water by Treatment with Zirconium Salt,
W79-01397 5D

SOBIN CHLOR-ALKALI, INC., ORRINGTON, ME. (ASSIGNEE).
Apparatus for Removing Mercury from Waste Water,
W79-01408 5D

SOCIETE ANONYME POUR L'ETUDE ET L'EXPLOITATION DES PROCEDES GEORGES CLAUDE, PARIS (FRANCE). (ASSIGNEE).
Method of Treatment of an Oxidizable Material by a Biochemical Process.
W79-01412 5D

SOUTHAMPTON UNIV. (ENGLAND).

SOUTHAMPTON UNIV. (ENGLAND).
A Note on the Use of Taxes to Control Pollution,
W79-01496 5G

SOUTHERN CALIFORNIA COASTAL WATER RESEARCH PROJECT, EL SEGUNDO, CALIFORNIA.
Geochemistry of Mercury in Palos Verdes Sediments,
W79-01250 5B

SOUTHERN CALIFORNIA METROPOLITAN WATER DISTRICT, LOS ANGELES.
The Legalization of Groundwater Shortage,
W79-01142 6E

SOUTHERN ILLINOIS UNIV. AT CARBONDALE. DEPT. OF CHEMISTRY AND BIOCHEMISTRY.
Donnan Dialysis Enrichment of Cations,
W79-01011 2K

SOUTHERN ILLINOIS UNIV., CARBONDALE. DEPT. OF CHEMISTRY AND BIOCHEMISTRY.
Ion Exchange Membrane Methods for Continuous Removal of Ions from Water and Trace Chemical Analysis,
W79-01327 5A

SOUTHERN PIEDMONT CONSERVATION RESEARCH CENTER, WATKINSVILLE. GA.
Remote Sensing of Water Levels in Small-Diameter Wells,
W79-01101 7B

SPESSARD L. HOLLAND LAW CENTER, GAINESVILLE, FL.
The Ordinary High Water Mark: Attempts at Settling an Unsettled Boundary Line,
W79-01009 6E

STANFORD UNIV., CA. DEPT. OF CIVIL ENGINEERING.
Direct Injection of Reclaimed Water into an Aquifer,
W79-01108 5D

SUTRON CORP., ARLINGTON, VA.
Qualitative Comparison of Three Dam Break Routing Models,
W79-01273 8B

TEMPLE, BARKER AND SLOANE INC., WELLESLEY HILLS, MA.
Analysis of Economic Effect of Environmental Regulations on Integrated Iron and Steel Industry. Volume II,
W79-01194 5G

TENNESSEE VALLEY AUTHORITY, KNOXVILLE.
Unsteady Flow Modeling of Dam-Break Waves,
W79-01268 8B

TEXAS A AND M UNIV., COLLEGE STATION. DEPT. OF POLITICAL SCIENCE.
An Alternative Perspective on Common Property Resource Allocation Decisions in the Coastal Zone,
W79-01494 6A

TEXAS A AND M UNIV., COLLEGE STATION. DEPT. OF WILDLIFE AND FISHERIES SCIENCES.
Trends in the Abundance of American Shad, Alosa Sapidissima, in the Delaware River Basin,
W79-01322 5C

TEXAS A AND M UNIV., COLLEGE STATION. WATER RESOURCES INST.
Optimal Operation of Large Agricultural Watersheds with Water Quality Constraints,
W79-01355 4D

TEXAS UNIV. AT AUSTIN. BUREAU OF ECONOMIC GEOLOGY.
Bed Forms and Stratification Types of Modern Gravel Meander Lobes, Nueces River, Texas,
W79-01044 2J

TEXAS UNIV. AT AUSTIN, PORT ARANSAS. PORT ARANSAS MARINE LAB.
The Toxic Effects of the Water Soluble Fractions of No. 2 Fuel Oil and Three Aromatic Hydrocarbons on the Behavior and Survival of Barnacle Larvae,
W79-01025 5C

TEXAS UNIV. AT DALLAS, RICHARDSON. INST. OF ENVIRONMENTAL SCIENCES.
Accumulation of Arsenic in Sediments of Lakes Treated with Sodium Arsenite,
W79-01253 5B

THAYER SCHOOL OF ENGINEERING, HANOVER, NH.
Analytic Solutions for Computer Flow Model Testing,
W79-01256 2L

THE PENNSYLVANIA STATE UNIV., DEPT. OF BIOLOGY.
Exceptional Tolerance to Low pH of some Tropical Blackwater Fish,
W79-01098 5C

TIPPETT-ABBETT-MCCARTHY-STRATTON, NEW YORK.
Simulation of Dam Break Flooding Under Normal and Probable Maximum Flood Conditions,
W79-01277 8B

TOKYO UNIV. OF FISHERIES (JAPAN). LAB. OF PHYSIOLOGY AND PATHOLOGY.
On the Pharmacological Effects of Diisopropylnaphthalene on Yellow-Tail (In Japanese),
W79-01450 5C

TORONTO UNIV. (ONTARIO). DEPT. OF MECHANICAL ENGINEERING.
The Effect of Hydraulic Jump on the Performance of a Single-Stage Flash Evaporator,
W79-01238 3A

TORONTO UNIV. (ONTARIO). DEPT. OF PHYSICS.
Acoustic Doppler Sounding of Falling Snow,
W79-01034 2C

TOYAMA UNIV. (JAPAN). FACULTY OF SCIENCE.
Effect of Acid Mine Drainage on the pH of Lake Toya, Japan,
W79-01258 5B

UNITED KINGDOM ATOMIC ENERGY AUTHORITY, LONDON (ENGLAND), (ASSIGNEE).
Purification of Water by Reverse Osmosis Using a Supported Semi-Permeable Membrane,
W79-01414 5F

UNITED STATES STEEL CORP., PITTSBURGH, PA. (ASSIGNEE).
Methods and Compositions for Dispersing Oil Films,
W79-01407 5G

UNIVERSITY OF SOUTH FLORIDA, TAMPA. DEPT. OF BIOLOGY.
Effects of Chelated Iron on the Growth of Two Species of Vallisneria,
W79-01446 5C

UTAH STATE UNIV., LOGAN. DEPT. OF BIOLOGY.
The Microbial Ecology of the Great Salt Lake North Arm,
W79-01346 5C

The MicroBial Ecology of the Great Salt Lake,
W79-01347 5C

UTAH STATE UNIV., LOGAN. DEPT. OF ECONOMICS.
Energy and the Colorado River,
W79-01167 3E

UTAH STATE UNIV., LOGAN. DEPT. OF SOIL SCIENCE AND BIOMETEOROLOGY.
Corn and Alfalfa Production as Influenced by Irrigation and Salinity,
W79-01136 3C

VERMONT UNIV., BURLINGTON. DEPT. OF ECONOMICS.
Economic Analysis of Alternative Sludge Disposal Methods in Vermont,
W79-01328 5E

VIKRAM UNIV., UJJAIN (INDIA). SCHOOL OF STUDIES IN BOTANY.
Pollution Studies of River Khan (Indore) India -- I. Biological Assessment of Pollution,
W79-01018 5A

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DEPT. OF AGRONOMY.
Controlling Erosion Along Highways with Vegetation or Other Protective Cover,
W79-01059 4D

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG, DEPT. OF BIOLOGY.
Cycling of Elements in Duckweed (Lemna Perpusilla) in an Ash Settling Basin and Swamp Drainage System,
W79-01458 5C

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DIV. OF ENVIRONMENTAL AND URBAN SYSTEMS.
Public Involvement in Natural Resource Development: A Review of Water Resource Planning,
W79-01153 6B

VIRGINIA STATE WATER CONTROL BOARD, RICHMOND.
Proposed (Guideline Model) Coastal and Riverine Flood Plain Zoning Ordinance,
W79-01147 6F

VIRGINIA UNIV., CHARLOTTESVILLE. DEPT. OF ENVIRONMENTAL SCIENCES.
Sand Transport Model of Barchan Dune Equilibrium,
W79-01043 2J

Man's Impact on the Barrier Islands of North Carolina,
W79-01220 6G

VIRGINIA UNIV., CHARLOTTESVILLE. SCHOOL OF LAW.
In Search of Common Nodules at UNCLOS III.
W79-01163 6E

VYSKUMNY USTAV PAPIERU A CELULOZY, BRATISLAVA (CZECHOSLOVAKIA).
Laboratory Investigation of Water Pollution by Organic Substances in Flax Wastes Delignification (Laboratorne sledovanie organickeho znecistenia vod pri delignifikacii lanovych odpadov),
W79-01085 5B

WARSAW UNIV. (POLAND). DEPT. OF ENVIRONMENTAL MICROBIOLOGY.
Effect of Copper and Tri- and Hexavalent Chromium on the Work of an Activated Sludge,
W79-01079 5D

WASHINGTON STATE UNIV., PULLMAN. DEPT. OF AGRONOMY AND SOILS.
Nitrogen and Irrigation Management to Reduce Return-Flow Pollution in the Columbia Basin,
W79-01001 5G

WASHINGTON UNIV., SEATTLE. COLL. OF FISHERIES.
Chronic Exposure of Chinook Salmon Eggs and Alevins to Gamma Irradiation: Effects on Their Return to Freshwater as Adults,
W79-01455 5C

WASHINGTON UNIV., SEATTLE. DEPT. OF OCEANOGRAPHY.
Persistent Blooms of Surf Diatoms Along the Northwest Coast,
W79-01200 5C

WASHINGTON UNIV., SEATTLE. FISHERIES RESEARCH INST.
The Impact of Logging on Salmonid Resources in the Pacific Northwest,
W79-01466 4C

WATER POLLUTION RESEARCH LAB., STEVENAGE (ENGLAND).
Gull Droppings and Their Effects on Water Quality,
W79-01041 5B

WATER RESOURCES COUNCIL, WASHINGTON, DC. TASK FORCE ON DAM-BREAK FLOOD ROUTING.
Proceedings of Dam-Break Flood Routing Model Workshop.
W79-01262 8B

WEBBER (WALTER) AND ASSOCIATES, BOULDER, CO.
Viewpoint from the Capital Market,
W79-01488 6B

WELSH NATIONAL WATER DEVELOPMENT AUTHORITY, CARDIFF.
Annual Catchment Losses-A Practical Method,
W79-01248 2D

WEST VIRGINIA UNIV., MORGANTOWN. WATER RESEARCH INST.
A Study for Improving the Aerobic-Media Trickling Filter for Wastewater Treatment,
W79-01123 5D

WISCONSIN ELECTRIC POWER CO., MILWAUKEE.
Unsteady Flow Analysis of Dam-Break Waves,
W79-01264 8B

WISCONSIN UNIV.-MADISON.
Guidelines for Mandatory Erosion Control Programs,
W79-01160 5G

WISCONSIN UNIV., MADISON. DEPT. OF METEOROLOGY.
Role of Turbulent Mixing in the Dispersion of Pollutants at the Edge of a Large Lake,
W79-01199 5C

WMI, INC., OKLAHOMA CITY, OK. (ASSIGNEE).
Self-Propelled Dredging Apparatus,
W79-01389 8C

WOODS HOLE OCEANOGRAPHIC INSTITUTION, MA.
Wind Effects on Surface to Bottom Fronts,
W79-01045 2L

The Behavior of Juvenile Atlantic Salmon (Salmo Salar) and Brook Trout (Salvelinus Fontinalis) with Regard to Temperature and to Water Velocity,
W79-01441 5C

Metabolism of Polychlorinated Biphenyls by Marine Bacteria,
W79-01443 5C

WORLD METEOROLOGICAL ORGANIZATION, GENEVA (SWITZERLAND).
Intercomparison of Conceptual Models Used in Operational Hydrological Forecasting.
W79-01062 2A

YESHIVA UNIV., NEW YORK. SCHOOL OF LAW.
Problems in Attempting to Translate Statutory Standards into Emission Limitations Under Air and Water Pollution Control Legislation,
W79-01151 5G

YUMA SOIL CONSERVATION DISTRICT, AZ.
Critique of the Challenges,
W79-01486 6B

W79-0100
W79-0100
W79-0100
W79-0100
W79-0100
W79-0100
W79-0100
W79-0100
W79-0100
W79-010
W79-010
W79-010

ACCESSION NUMBER INDEX

W79-01001 5G
W79-01002 6A
W79-01003 5D
W79-01004 5B
W79-01005 5C
W79-01006 5D
W79-01007 5B
W79-01008 5B
W79-01009 6E
W79-01010 5A
W79-01011 2K
W79-01012 5C
W79-01013 5C
W79-01014 5B
W79-01015 5C
W79-01016 5C
W79-01017 5C
W79-01018 5A
W79-01019 5C
W79-01020 5C
W79-01021 5C
W79-01022 5B
W79-01023 5B
W79-01024 5C
W79-01025 5C
W79-01026 5C
W79-01027 5C
W79-01028 5C
W79-01029 5C
W79-01030 5C
W79-01031 5C
W79-01032 5C
W79-01033 5C
W79-01034 2C
W79-01035 3B
W79-01036 2B
W79-01037 7B
W79-01038 5B
W79-01039 2K
W79-01040 5B
W79-01041 5B
W79-01042 5A
W79-01043 2J
W79-01044 2J
W79-01045 2L
W79-01046 5B
W79-01047 2E
W79-01048 8G
W79-01049 8D
W79-01050 8D
W79-01051 8D
W79-01052 8I
W79-01053 8B
W79-01054 8D
W79-01055 2L
W79-01056 2B
W79-01057 8G
W79-01058 3B
W79-01059 4D
W79-01060 2E
W79-01061 4C
W79-01062 2A
W79-01063 3B
W79-01064 2K
W79-01065 2J
W79-01066 5D
W79-01067 5D
W79-01068 5D
W79-01069 5D
W79-01070 5A
W79-01071 5D
W79-01072 5D
W79-01073 5E
W79-01074 5A
W79-01075 5D
W79-01076 5D
W79-01077 5D
W79-01078 5D
W79-01079 5D
W79-01080 5D
W79-01081 5D
W79-01082 5E
W79-01083 5D
W79-01084 5D
W79-01085 5B
W79-01086 5C
W79-01087 4D
W79-01088 5D
W79-01089 5C
W79-01090 5B
W79-01091 2J
W79-01092 2I
W79-01093 5D
W79-01094 3F
W79-01095 5D
W79-01096 5C
W79-01097 2I
W79-01098 5C
W79-01099 2I
W79-01100 5B
W79-01101 7B
W79-01102 8B
W79-01103 8G
W79-01104 8G
W79-01105 4B
W79-01106 3C
W79-01107 8B
W79-01108 5D
W79-01109 8B
W79-01110 8B
W79-01111 2F
W79-01112 6B
W79-01113 5B
W79-01114 8G
W79-01115 2F
W79-01116 4B
W79-01117 4B
W79-01118 6E
W79-01119 7C
W79-01120 8G
W79-01121 5D
W79-01122 6B
W79-01123 5D
W79-01124 5D
W79-01125 2I
W79-01126 3A
W79-01127 5E
W79-01128 3A
W79-01129 3A
W79-01130 4D
W79-01131 4D
W79-01132 5B
W79-01133 5A
W79-01134 5B
W79-01135 5C
W79-01136 3C
W79-01137 5G
W79-01138 6B
W79-01139 5B
W79-01140 6E
W79-01141 6E
W79-01142 6E
W79-01143 6E
W79-01144 5G
W79-01145 6E
W79-01146 5G
W79-01147 6F
W79-01148 6F
W79-01149 6E
W79-01150 5G
W79-01151 5G
W79-01152 5G
W79-01153 6B
W79-01154 5G
W79-01155 5G
W79-01156 5G
W79-01157 6E
W79-01158 6E
W79-01159 5G
W79-01160 5G
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W79-01163 6E
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W79-01165 5G
W79-01166 5G
W79-01167 3E
W79-01168 6E
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W79-01186 6E
W79-01187 6E
W79-01188 6E
W79-01189 6E
W79-01190 6E
W79-01191 6E
W79-01192 6E
W79-01193 6B
W79-01194 5G
W79-01195 5C
W79-01196 5D
W79-01197 5C
W79-01198 5C
W79-01199 5C
W79-01200 5C
W79-01201 5C
W79-01202 5C
W79-01203 5C
W79-01204 5C
W79-01205 5G
W79-01206 5D
W79-01207 5B
W79-01208 5B
W79-01209 5B
W79-01210 5G
W79-01211 2H
W79-01212 2K
W79-01213 2H
W79-01214 5C
W79-01215 2K
W79-01216 2H
W79-01217 2L
W79-01218 2L
W79-01219 5C
W79-01220 6G
W79-01221 5C
W79-01222 5C
W79-01223 5C
W79-01224 5C
W79-01225 2L
W79-01226 2L
W79-01227 6E
W79-01228 4B
W79-01229 6G
W79-01230 4B
W79-01231 3B
W79-01232 8G
W79-01233 8G
W79-01234 8G
W79-01235 8G
W79-01236 5C
W79-01237 5C
W79-01238 3A
W79-01239 3A
W79-01240 6B
W79-01241 5C
W79-01242 6G
W79-01243 5G
W79-01244 2B
W79-01245 5B
W79-01246 2I
W79-01247 2B
W79-01248 2D
W79-01249 5G
W79-01250 5B
W79-01251 5A
W79-01252 5B
W79-01253 5B
W79-01254 5B
W79-01255 8B
W79-01256 2L
W79-01257 4A
W79-01258 5B
W79-01259 5C
W79-01260 4C
W79-01261 2B
W79-01262 8B
W79-01263 8B
W79-01264 8B
W79-01265 8B
W79-01266 4A
W79-01267 8B
W79-01268 8B
W79-01269 8B
W79-01270 8B
W79-01271 8B
W79-01272 8B
W79-01273 8B
W79-01274 8B
W79-01275 8B
W79-01276 8B
W79-01277 8B
W79-01278 8B
W79-01279 4B
W79-01280 3A
W79-01281 8G
W79-01282 5C
W79-01283 2L
W79-01284 5C
W79-01285 5C
W79-01286 5C
W79-01287 2I
W79-01288 5B
W79-01289 2L
W79-01290 5C
W79-01291 5B
W79-01292 4C
W79-01293 5C
W79-01294 2I
W79-01295 6E
W79-01296 5C
W79-01297 2H
W79-01298 2H
W79-01299 2H
W79-01300 2H
W79-01301 2G
W79-01302 2G
W79-01303 2G
W79-01304 2H
W79-01305 2H
W79-01306 2L
W79-01307 5G
W79-01308 5G
W79-01309 5G
W79-01310 5D
W79-01311 5F
W79-01312 5F
W79-01313 5F
W79-01314 5D
W79-01315 5D
W79-01316 5D
W79-01317 5D
W79-01318 5D
W79-01319 5D
W79-01320 5D
W79-01321 5D
W79-01322 5C
W79-01323 5G
W79-01324 5D
W79-01325 5D
W79-01326 5C
W79-01327 5A
W79-01328 5E
W79-01329 5D
W79-01330 5C
W79-01331 5C
W79-01332 5C

W79-01333	5A
W79-01334	5C
W79-01335	6E
W79-01336	4A
W79-01337	5C
W79-01338	5B
W79-01339	3A
W79-01340	3A
W79-01341	2F
W79-01342	3A
W79-01343	3A
W79-01344	5A
W79-01345	5A
W79-01346	5C
W79-01347	5C
W79-01348	6B
W79-01349	5D
W79-01350	5C
W79-01351	5F
W79-01352	5D
W79-01353	6B
W79-01354	5G
W79-01355	4D
W79-01356	5B
W79-01357	2B
W79-01358	5D
W79-01359	4A
W79-01360	3F
W79-01361	6B
W79-01362	5C
W79-01363	5A
W79-01364	6D
W79-01365	2F
W79-01366	2E
W79-01367	7C
W79-01368	7C
W79-01369	7C
W79-01370	7C
W79-01371	7C
W79-01372	7C
W79-01373	7C
W79-01374	2K
W79-01375	7C
W79-01376	7C
W79-01377	2F
W79-01378	8C
W79-01379	7C
W79-01380	4A
W79-01381	5G
W79-01382	7C
W79-01383	7C
W79-01384	2F
W79-01385	4A
W79-01386	2C
W79-01387	2F
W79-01388	7B
W79-01389	8C
W79-01390	3F
W79-01391	5D
W79-01392	5D
W79-01393	5F
W79-01394	5G
W79-01395	5F
W79-01396	5D
W79-01397	5D
W79-01398	5E
W79-01399	5D
W79-01400	8A
W79-01401	5F
W79-01402	5F
W79-01403	5D
W79-01404	5D
W79-01405	5F
W79-01406	5D
W79-01407	5G
W79-01408	5D
W79-01409	5D
W79-01410	3F
W79-01411	3F
W79-01412	5D
W79-01413	5D
W79-01414	5F
W79-01415	5D
W79-01416	5D
W79-01417	5G
W79-01418	5D
W79-01419	5G
W79-01420	5D
W79-01421	5B
W79-01422	2F
W79-01423	2H
W79-01424	5D
W79-01425	3F
W79-01426	4D
W79-01427	2H
W79-01428	5D
W79-01429	3A
W79-01430	6B
W79-01431	6G
W79-01432	6G
W79-01433	2L
W79-01434	6G
W79-01435	5C
W79-01436	5C
W79-01437	5C
W79-01438	5C
W79-01439	5C
W79-01440	5C
W79-01441	5C
W79-01442	5C
W79-01443	5C
W79-01444	5B
W79-01445	5C
W79-01446	5C
W79-01447	5G
W79-01448	5C
W79-01449	5C
W79-01450	5C
W79-01451	5C
W79-01452	5C
W79-01453	5C
W79-01454	5C
W79-01455	5C
W79-01456	5C
W79-01457	5C
W79-01458	5C
W79-01459	5C
W79-01460	5A
W79-01461	5B
W79-01462	5C
W79-01463	5G
W79-01464	5D
W79-01465	5C
W79-01466	4C
W79-01467	5C
W79-01468	5B
W79-01469	5C
W79-01470	4A
W79-01471	5C
W79-01472	5B
W79-01473	5B
W79-01474	5A
W79-01475	5C
W79-01476	5A
W79-01477	5C
W79-01478	6B
W79-01479	6B
W79-01480	6B
W79-01481	6B
W79-01482	6B
W79-01483	6B
W79-01484	6B
W79-01485	6B
W79-01486	6B
W79-01487	6B
W79-01488	6B
W79-01489	6B
W79-01490	6B
W79-01491	6B
W79-01492	6A
W79-01493	6A
W79-01494	6A
W79-01495	6A
W79-01496	5G
W79-01497	5G
W79-01498	5G
W79-01499	5G
W79-01500	6B

ABSTRACT SOURCES

SOURCE	ACCESSION NUMBER	TOTAL
A. CENTERS OF COMPETENCE		
Colorado State University, Irrigation Return Flow Quality	W79-01001, 01004	2
Franklin Institute (FIRL), Municipal and Industrial Wastewater Treatment Technology	W79-01066--01085	20
Illinois State Water Survey, Hydrology	W79-01034--01065 01243--01258 01260--01278	67
National Water Well Association, Water Well Construction Technology	W79-01101--01120	20
University of Florida, Eastern U. S. Water Law	W79-01140--01192	53
University of Wisconsin, Eutrophication	W79-01195--01205 01470--01477	19
University of Wisconsin, Water Resources Economics	W79-01193--01194 01478--01500	25
B. STATE WATER RESOURCES RESEARCH INSTITUTES	W79-01002--01003 01005--01011 01086--01100 01121--01139 01232--01242 01279--01282 01325--01331 01334--01352 01362--01363 01421--01429	95
C. OTHER		
BioSciences Information Service	W79-01221, 01225 01259 01285--01286	13

SOURCE	ACCESSION NUMBER	TOTAL
C. OTHER		
BioSciences Information Service (Continued)	W79-01290, 01293 01322 01332--01333 01354, 01360 01447	
Environmental Information Services, Inc. (Effects of Pollutants on Aquatic Life)	W79-01012--01033 01430--01446 01448--01469	61
Information Planning Associates, Inc.	W79-01206--01210 01307--01321 01323--01324 01353 01355--01359 01361	29
Ocean Engineering Information Service (Patents)	W79-01388--01420	33
Office of Water Research and Technology	W79-01227--01231	5
U. S. Geological Survey	W79-01364--01387	24
University of Massachusetts (Wetlands)	W79-01211--01220 01222--01224 01226 01283--01284 01287--01289 01291--01292 01294--01306	34

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